

Validation documentation
TCM - Granulated herbal extracts (PhytoComm)

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 *TCM - Granulated herbal extracts (PhytoComm)*.

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.

Validity scope of this document

This validation documentation describes the results of the validation of the reference database for the substance class *TCM - Granulated herbal extracts (PhytoComm)*. 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 database is exclusively established from spectra which have been recorded by *HiperScan GmbH* for 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.
 - In three separately evaluated validation runs, calibration spectra, spectra from independent samples and spectra from independent field samples (described further below as *Type A*, *B* or *C*) are presented to the *IdentModule* for evaluation.
 - 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*).
- For each individual substance, the unambiguous identifiability with *Apo-Ident* and the demarkation against all other database substances is proven.

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 established. 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 from independent samples not included in the generation of the respective model received but were measured by *HiperScan GmbH*. These also include reference spectra from other substance classes and spectra which are not declared as reference spectra.
- c) *Type C*: Spectra from independent field samples. These measurements were recorded under normal everyday conditions by pharmacy staff. The spectra belong both to substances of the substance class to be examined and to substances from different classes.

All manufacturers' batches from which spectra flow into the validation are listed by substance in this document: for substances included in the substance class *TCM - Granulated herbal extracts (PhytoComm)* in the respective validation reports; otherwise in attachments *A*, *B* and *C*.

Furthermore remains valid: validation spectra may only be removed if a spectrum error 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.

Also, the substance classes with **TCM – Granulated herbal extracts** are separated supplier-specifically. The granulates from the suppliers *HerbaSinica*, *PhytoComm* and *China-Medica* are hardly comparable with each other due to their spectra, because extracts of respectively different drug batches with different carrier materials are granulated. The spectra for all batches from these suppliers are recorded by *HiperScan GmbH* and entered in the respective database. The suppliers organise the respective tests themselves and keep the test certificates. The process implemented with *HerbaSinica* is a particularity: The reference samples are sent to a test laboratory which determines the identity of the sample and sends the container to *HiperScan GmbH* if the result is positive.

A new evaluation option was created for the class *TCM – Granulated herbal extracts (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 this supplier, whereby all useable batches from the supplier are known.

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 Pharmacopeia* as a near-infrared spectrometer and proves the validity of the reference database with the existing validation documentation. This means that *Apo-Ident* can be used as an alternative testing method for testing raw materials at pharmacies.

Explanation of terminology

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

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

Substance classes are units of the organisational structure of the *IdentModule*. The substance classes are substance [databases](#) which are also broadly independently subscribable. On the one hand, the liquid and semi-solid substances are separated from the solid powders because they are measured against different references and therefore the spectra cannot be compared. On the other hand, for example the Pharmacopoeia substances are kept separated from the manufacturer-specific databases 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, *Huang Qi* granulate from the company *HerbaSinica* neither needs to be delimited from *Huang Qi* granulate from the company *PhytoComm* 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 $\mathbf{X}$.

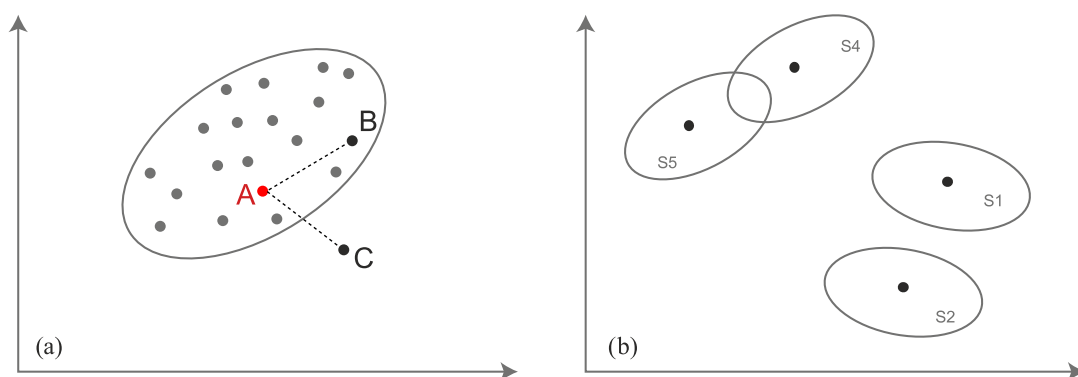


Figure 1: (a) The *Mahalanobis distance* from *A* to *B* is less than from *A* to *C*. However, the Euclidean distances are identical. (b) The *Mahalanobis distance* between the two measurement series *S4* and *S5* is smaller than between *S1* and *S2*. However, the Euclidean distances are identical.

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].

As sample applies the substance from a package. Multiple extractions of substance from the same package for spectrum recordings will be ascribed to the same sample. This also applies if multiple of such samples originate from the same batch.

Does a supplier conversely take 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 36 840 spectra from 1187 different batches for a total of 270 substances were used to validate the substance class *TCM - Granulated herbal extracts (PhytoComm)*.

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
TCM - Granulated herbal extracts (PhytoComm)	201	315	21 316

From category *A* a total of 21 316 spectra from 315 batches for a total of 201 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
TCM - Granulated herbal extracts (PhytoComm)	203	318	13 543

From category *B* a total of 13 543 spectra from 318 batches for a total of 203 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
TCM - Granulated herbal extracts (PhytoComm)	268	965	1981

From category *C* a total of 1981 spectra from 965 batches for a total of 268 substances were taken into account for validation.

Validation results

The validation runs checked whether the substances/substance groups in the substance class *TCM - Granulated herbal extracts (PhytoComm)* can be distinguished from 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 *TCM - Granulated herbal extracts (PhytoComm)* 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	24	21 292	24	4 263 176
Type B	94	13 229	98	2 708 722
Type C	678	378	1335	395 790

Some substances/substance groups in the substance class *TCM - Granulated herbal extracts (PhytoComm)* can only be distinguished from other substances with limitations. (*False positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.999 30 % (> 99.999 20 %)	99.859 66 % (> 99.840 13 %)
Type B	99.996 96 % (> 99.996 78 %)	99.363 35 % (> 99.327 62 %)
Type C	99.838 17 % (> 99.836 78 %)	19.201 14 % (> 18.930 11 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower 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 1.3-2017-04

Validated substance/substance group **Ai Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60407-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ai Ye; Artemisiae argyi folium

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ai Ye	G033H0613621	62017	40	from supplier
PhytoComm	Ai Ye	G033H0613621	62018	40	from supplier

Validation samples

A total of 36 840 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 *Ai Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ai Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ai Ye	G033H0613621	62017 [†]	20
PhytoComm	Ai Ye	G033H0613621	62018 [†]	20

- 13 503 spectra from a total of 317 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.

- 5 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Ai Ye*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ai Ye	G033H0613021	2
Phytocomm	Ai Ye	G033H0613421	1
Phytocomm	Ai Ye	G033H0613022	1
Phytocomm	Ai Ye	G033H0613021	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ai Ye* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ai Ye* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	2	40	0	13 501
Type C	6	0	5	1970

The substance/substance group *Ai Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	99.9754 % (> 99.9402 %)	100.0000 % (> 85.0000 %)
Type C	99.7028 % (> 99.4238 %)	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
62017	62017	0.00	14.30
62018	62018	0.00	14.44

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ba Ji Tian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60138-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ba Ji Tian; Morindae officinalis radix

Special notes

When selecting the *Ba Ji Tian* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ba Ji Tian	G165H0445621	61937	40	from supplier
PhytoComm	Ba Ji Tian	G165H0445621	61938	40	from supplier

Validation samples

A total of 36 840 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 *Ba Ji Tian*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ba Ji Tian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ba Ji Tian	G165H0445621	61937 [†]	20
PhytoComm	Ba Ji Tian	G165H0445621	61938 [†]	20

- 13 503 spectra from a total of 317 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.

- 6 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Ba Ji Tian*.

Supplier	Substance	Batch	Spectra
phytoComm	Ba Ji Tian	G165H0445021	2
PhytoComm	Ba Ji Tian	G165H0445021	2
PhytoComm	Ba Ji Tian	G165H0445222	1
PhytoComm	Ba Ji Tian	H0445921	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*.

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ba Ji Tian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ba Ji Tian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	4	0	6	1971

The substance/substance group *Ba Ji Tian* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8430 % (> 99.5639 %)	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
61937	61937	0.00	6.17
61938	61938	0.00	6.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Guo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60455-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Guo; Ginkgonis bilobae semen

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Guo	G114H0509521	61685	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Bai Guo*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Bai Guo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Guo	G114H0509521	61685 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Bai Guo*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Guo	G114H0509521	1
phytocomm	Bai Guo	G114H0509022	1
Phytocomm	Bai Guo	G114H0509321	2
Caelo	Bai Guo	g114h0509022	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	1	4	1975

The substance/substance group *Bai Guo* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9534 % (> 99.6744 %)	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
61685	61685	0.00	11.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai He**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60093-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai He; Lili bulb

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai He	G139H0607421	61355	40	from supplier
PhytoComm	Bai He	G139H0607421	61691	40	from supplier

Validation samples

A total of 36 840 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 *Bai He*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Bai He*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai He	G139H0607421	61355 [†]	20
PhytoComm	Bai He	G139H0607421	61691 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Bai He*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai He	G139H0607421	2
Phytocomm	Bai He	g139h0607221	1
PhytoComm	Bai He	G139H0607421	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
PhytoComm	Bai He	G139H0607321	1
phytoComm	Bai He	H0607021	1
PhytoComm	Bai He	H0607021	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	79	1	21 236
Type B	0	40	0	13 503
Type C	5	3	5	1968

The substance/substance group *Bai He* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	98.7500 % (> 95.0000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.7441 % (> 99.4648 %)	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
61355	61355	0.00	8.92
61691	61691	0.00	9.17

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Hua She She Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60039-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Hua She She Cao; Oldenlandiae diffusae herba

Special notes

When selecting the *Bai Hua She She Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Hua She She ...	G173H1153421	61089	40	from supplier
PhytoComm	Bai Hua She She ...	G173H1153421	61629	40	from supplier
PhytoComm	Bai Hua She She ...	G173H1153421	61689	40	from supplier
PhytoComm	Bai Hua She She ...	G173H1153522	61967	40	from supplier
PhytoComm	Bai Hua She She ...	G173H1153522	61968	40	from supplier

Validation samples

A total of 36 840 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 *Bai Hua She She Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 139 spectra of 5 reference samples from the substance/substance group *Bai Hua She She Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Hua She She Cao	G173H1153421	61089 [†]	19
PhytoComm	Bai Hua She She Cao	G173H1153421	61338	60
PhytoComm	Bai Hua She She Cao	G173H1153421	61689 [†]	20
PhytoComm	Bai Hua She She Cao	G173H1153522	61967 [†]	20
PhytoComm	Bai Hua She She Cao	G173H1153522	61968 [†]	20

- 13 404 spectra from a total of 316 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.

- 9 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Bai Hua She She Cao*.

[†]These spectra were recorded from 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
Phytocomm	Bai Hua She She Cao	G173H1153421	3
Phytocomm	Bai Hua She She Cao	G173H1153222	3
PhytoComm	Bai Hua She She Cao	G173H1153222	1
PhytoComm	Bai Hua She She Cao	H1153923	2

- 1972 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bai Hua She She Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Hua She She Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	139	0	13 404
Type C	10	3	6	1962

The substance/substance group *Bai Hua She She Cao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.6835 %)
Type C	99.2154 % (> 98.9360 %)	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
61089	61089	0.00	17.13
61629	61629	0.00	17.09
61689	61689	0.00	15.73
61967	61967	0.00	22.07
61968	61968	0.00	22.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Jiang Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50319-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Jiang Cao; Patriniae herba

Special notes

When selecting the *Bai Jiang Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Jiang Cao	G181H1180522	61783	40	from supplier
PhytoComm	Bai Jiang Cao	G181H1180522	61825	40	from supplier

Validation samples

A total of 36 840 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 *Bai Jiang Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Bai Jiang Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Jiang Cao	G181H1180522	61783 [†]	20
PhytoComm	Bai Jiang Cao	G181H1180522	61825 [†]	20

- 13 503 spectra from a total of 317 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.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Bai Jiang Cao*.

Supplier	Substance	Batch	Spectra
PhytoComm	Bai Jiang Cao	(G181)H1180022	1
PhytoComm	Bai Jiang Cao	G181H1180422	1
PhytoComm	Bai Jiang Cao	G181H1180022	1
PhytoComm	Bai Jiang Cao	G181H1180321	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*.

- 1977 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bai Jiang Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Jiang Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	1	3	1977

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4424 %)	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
61783	61783	0.00	9.90
61825	61825	0.00	8.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Mao Gen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60654-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Mao Gen; Imperatae cylindricae rhizoma

Special notes

When selecting the *Bai Mao Gen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Mao Gen	G125H0512521	61748	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Bai Mao Gen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Bai Mao Gen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Mao Gen	G125H0512521	61748 [†]	20

- 13 523 spectra from a total of 317 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.

- 2 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Bai Mao Gen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Mao Gen	G125H0512221	2

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Bai Mao Gen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Mao Gen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	2	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61748	61748	0.00	6.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Qian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60327-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Qian; Cynanchi stauntonii rhizoma et radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Qian	G087HS068NW1	61719	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Bai Qian*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Bai Qian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Qian	G087HS068NW1	61719 [†]	20

- 13 523 spectra from a total of 317 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.

- 4 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Bai Qian*.

Supplier	Substance	Batch	Spectra
phytoComm	Bai Qian	BP010536	1
PhytoComm	Bai Qian	G087H0505922	2
PhytoComm	Bai Qian	G087H0505922	1

- 1977 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 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 *Bai Qian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Qian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	37	3	21 276
Type B	4	20	0	13 519
Type C	5	0	4	1972

The substance/substance group *Bai Qian* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	92.5000 % (> 85.0000 %)
Type B	99.9908 % (> 99.9559 %)	100.0000 % (> 70.0000 %)
Type C	99.8050 % (> 99.5262 %)	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
61719	61719	0.00	3.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Shao Yao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60007-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Shao Yao; Paeoniae lactiflorae albus radix

Special notes

When selecting the *Bai Shao Yao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Shao Yao	G179H0502422	61626	40	from supplier
PhytoComm	Bai Shao Yao	G179H0502521	61652	40	from supplier
PhytoComm	Bai Shao Yao	G179H0502522	61796	40	from supplier
PhytoComm	Bai Shao Yao	G179H0502522	61813	40	from supplier
PhytoComm	Bai Shao Yao	G179H0502621	61955	40	from supplier
PhytoComm	Bai Shao Yao	G179H0502621	61956	40	from supplier

Validation samples

A total of 36 840 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 *Bai Shao Yao*. These samples are listed above in the [calibration samples](#) section.
- 21 076 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 6 reference samples from the substance/substance group *Bai Shao Yao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Shao Yao	G179H0502422	61335	60
PhytoComm	Bai Shao Yao	G179H0502521	61652 [†]	20
PhytoComm	Bai Shao Yao	G179H0502522	61796 [†]	20
PhytoComm	Bai Shao Yao	G179H0502522	61813 [†]	20
PhytoComm	Bai Shao Yao	G179H0502621	61955 [†]	20
PhytoComm	Bai Shao Yao	G179H0502621	61956 [†]	20

- 13 383 spectra from a total of 314 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.

- 20 spectra from 11 *Apo-Ident* customers from 8 batches from the substance/substance group *Bai Shao Yao*.

[†]These spectra were recorded from 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
Phytocomm	Bai Shao Yao	G179H0502521	5
PhytoComm	Bai Shao Yao	G179H0502323	1
PhytoComm	Bai Shao Yao	1214401	1
PhytoComm	Bai Shao Yao	G179H0502025	1
Phytocomm	Bai Shao Yao	G179H0502025	3
PhytoComm	Bai Shao Yao	G179H0502121	1
Phytocomm	Bai Shao Yao	G179H0502121	2
PhytoComm	Bai Shao Yao	G179H0502322	2
Phytocomm	Bai Shao Yao	G179H0502322	1
Phytocomm	Bai Shao Yao	g179h0502322	1
Phytocomm	Bai Shao Yao	g17h0502323	1
phythocom	Bai Shao Yao	G179H0502121	1

- 1961 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bai Shao Yao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Shao Yao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 076
Type B	0	156	4	13 383
Type C	11	16	4	1950

The substance/substance group *Bai Shao Yao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9294 %)	97.5000 % (> 95.6250 %)
Type C	99.3312 % (> 99.0516 %)	80.0000 % (> 65.0000 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
61626	61626	0.00	7.20
61652	61652	0.00	14.13
61796	61796	0.00	11.69
61813	61813	0.00	10.12
61955	61955	0.00	9.35
61956	61956	0.00	9.43

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Tou Weng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60748-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Tou Weng; Pulsatillae radix

Special notes

When selecting the *Bai Tou Weng* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Tou Weng	G207H0511521	61645	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Bai Tou Weng*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Bai Tou Weng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Tou Weng	G207H0511521	61645 [†]	20

- 13 523 spectra from a total of 317 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.

- 6 spectra from 4 *Apo-Ident* customers from 2 batches from the substance/substance group *Bai Tou Weng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Tou Weng	G207H0511221	1
Phytocomm	Bai Tou Weng	G207H0511521	4
PhytoComm	Bai Tou Weng	G207H0511221	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 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 *Bai Tou Weng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Tou Weng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	6	0	1974

The substance/substance group *Bai Tou Weng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9378 % (> 99.6587 %)	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
61645	61645	0.00	10.04

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Xian Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60208-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Xian Pi; Dictamni cortex; Dictamni dasycarpi cortex radices

Special notes

When selecting the *Bai Xian Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Xian Pi	G090H0515521	61707	40	from supplier
PhytoComm	Bai Xian Pi	G090HS355PM1	61849	40	from supplier
PhytoComm	Bai Xian Pi	G090HS355PM1	61850	40	from supplier

Validation samples

A total of 36 840 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 *Bai Xian Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Bai Xian Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Xian Pi	G090H0515521	61707 [†]	20
PhytoComm	Bai Xian Pi	G090HS355PM1	61849 [†]	20
PhytoComm	Bai Xian Pi	G090HS355PM1	61850 [†]	20

- 13 483 spectra from a total of 316 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.

- 7 spectra from 4 *Apo-Ident* customers from 2 batches from the substance/substance group *Bai Xian Pi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Xian Pi	G090H0515121	3
PhytoComm	Bai Xian Pi	G090H0515121	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
PhytoComm	Bai Xian Pi	H0515921	1
Phytocomm	Bai Xian Pi	H0515921	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	119	1	21 196
Type B	10	57	3	13 473
Type C	4	0	7	1970

The substance/substance group *Bai Xian Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	99.1667 % (> 96.6667 %)
Type B	99.9384 % (> 99.9032 %)	95.0000 % (> 90.0000 %)
Type C	99.7357 % (> 99.4565 %)	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
61707	61707	0.00	8.17
61849	61849	0.00	6.29
61850	61850	0.00	6.72

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60235-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Zhi; Angelicae dahuricae radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Zhi	G020H0503522	61770	40	from supplier
PhytoComm	Bai Zhi	G020H0503522	61820	40	from supplier

Validation samples

A total of 36 840 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 *Bai Zhi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Bai Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Zhi	G020H0503522	61770 [†]	20
PhytoComm	Bai Zhi	G020H0503522	61820 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Bai Zhi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Zhi	G020H0503421	1
PhytoComm	Bai Zhi	G020H0503024	1
Phytocomm	Bai Zhi	G020H0503024	2
Phytocomm	Bai Zhi	G020H0503122	2
Phytocomm	Bai Zhi	G020H0503223	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bai Zhi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Zhi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	8	0	7	1966

The substance/substance group *Bai Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.6834 % (> 99.4041 %)	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
61770	61770	0.00	11.58
61820	61820	0.00	12.22

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Zhu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60015-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Zhu; Atractylodis macrocephalae rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Zhu	G041H0501321	60966	40	from supplier
PhytoComm	Bai Zhu	G041H0501321	61596	40	from supplier
PhytoComm	Bai Zhu	G041H0501422	61598	40	from supplier
PhytoComm	Bai Zhu	G041H0501621	61837	40	from supplier

Validation samples

A total of 36 840 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 *Bai Zhu*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 170 spectra of 3 reference samples from the substance/substance group *Bai Zhu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Zhu	G041H0501321	61305	75
PhytoComm	Bai Zhu	G041H0501422	61307	75
PhytoComm	Bai Zhu	G041H0501621	61837 [†]	20

- 13 373 spectra from a total of 315 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.

- 21 spectra from 9 *Apo-Ident* customers from 5 batches from the substance/substance group *Bai Zhu*.

Supplier	Substance	Batch	Spectra
phythocom	Bai Zhu	G041H0501221	4
phythocom	Bai Zhu	g041h0501221	2

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
phythocom	Bai Zhu	h0501021	1
Phytocomm	Bai Zhu	G041H0501422	2
PhytoComm	Bai Zhu	G041H0501221	1
Phytocomm	Bai Zhu	G041H0501221	3
Phytocomm	Bai Zhu	g041h0501221	3
PhytoComm	Bai Zhu	H0501021	1
Phytocomm	Bai Zhu	H0501021	4

- 1960 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bai Zhu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bai Zhu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	1	167	3	13 372
Type C	16	3	18	1944

The substance/substance group *Bai Zhu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	99.9938 % (> 99.9585 %)	98.2353 % (> 96.4706 %)
Type C	99.3862 % (> 99.1065 %)	14.2857 % (≥ 0.0000 %)

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
60966	60966	0.00	7.53
61596	61596	0.00	6.78
61598	61598	0.00	6.70
61837	61837	0.00	9.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bai Zi Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60197-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bai Zi Ren; Biotae orientalis semen; Platycladi semen

Special notes

When selecting the *Bai Zi Ren* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bai Zi Ren	G052HS187	61640	40	from supplier
PhytoComm	Bai Zi Ren	G052HS187PG1	61848	40	from supplier

Validation samples

A total of 36 840 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 *Bai Zi Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Bai Zi Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bai Zi Ren	G052HS187	61640 [†]	20
PhytoComm	Bai Zi Ren	G052HS187PG1	61848 [†]	20

- 13 503 spectra from a total of 316 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.

- 5 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Bai Zi Ren*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bai Zi Ren	g052f110315	1
Phytocomm	Bai Zi Ren	G052HS187	2
Phytocomm	Bai Zi Ren	g952f110315	1
phythocom	Bai Zi Ren	G052F110315	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	79	1	21 236
Type B	2	38	2	13 501
Type C	0	1	4	1976

The substance/substance group *Bai Zi Ren* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	98.7500 % (> 95.0000 %)
Type B	99.9507 % (> 99.9156 %)	95.0000 % (> 87.5000 %)
Type C	100.0000 % (> 99.4420 %)	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
61640	61640	0.00	6.43
61848	61848	0.00	7.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ban Lan Gen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60230-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ban Lan Gen; Isatidis radix

Special notes

When selecting the *Ban Lan Gen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ban Lan Gen	G128H0816521	61993	40	from supplier
PhytoComm	Ban Lan Gen	G128H0816521	61994	40	from supplier

Validation samples

A total of 36 840 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 *Ban Lan Gen*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ban Lan Gen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ban Lan Gen	G128H0816521	61993 [†]	20
PhytoComm	Ban Lan Gen	G128H0816521	61994 [†]	20

- 13 503 spectra from a total of 317 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.

- 12 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Ban Lan Gen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ban Lan Gen	G128H0816421	2
Phytocomm	Ban Lan Gen	G128H0816022	2
PhytoComm	Ban Lan Gen	G128H0816022	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
PhytoComm	Ban Lan Gen	G128H0816221	3
PhytoComm	Ban Lan Gen	G128H0816221	2
Herbasinica	Ban Lan Gen	GENTIANAEMACROPHYLL	1
PhytoComm	Ban Lan Gen	H0816922	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ban Lan Gen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ban Lan Gen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	6	1	11	1963

The substance/substance group *Ban Lan Gen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8268 % (> 99.5473 %)	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
61993	61993	0.00	9.57
61994	61994	0.00	8.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ban Xia (Jiang)**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60019-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ban Xia (Jiang); Pinelliae rhizoma praeparatum cum zingibere

Special notes

When selecting the *Ban Xia (Jiang)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ban Xia (Jiang)	G191H0526322	61035	40	from supplier
PhytoComm	Ban Xia (Jiang)	G191H0526421	61096	40	from supplier
PhytoComm	Ban Xia (Jiang)	G191H0526322	61476	40	from supplier
PhytoComm	Ban Xia (Jiang)	G191H0526322	61763	40	from supplier
PhytoComm	Ban Xia (Jiang)	G191H0526521	61786	40	from supplier
PhytoComm	Ban Xia (Jiang)	G191H0526521	61829	40	from supplier

Validation samples

A total of 36 840 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 *Ban Xia (Jiang)*. These samples are listed above in the [calibration samples](#) section.
- 21 076 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 155 spectra of 5 reference samples from the substance/substance group *Ban Xia (Jiang)*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ban Xia (Jiang)	G191H0526421	61096 [†]	20
PhytoComm	Ban Xia (Jiang)	G191H0526322	61184	75
PhytoComm	Ban Xia (Jiang)	G191H0526322	61763 [†]	20
PhytoComm	Ban Xia (Jiang)	G191H0526521	61786 [†]	20
PhytoComm	Ban Xia (Jiang)	G191H0526521	61829 [†]	20

- 13 388 spectra from a total of 315 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.

- 11 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Ban Xia (Jiang)*.

[†]These spectra were recorded from 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
Phytocomm	Ban Xia (Jiang)	G191H0526023	1
PhytoComm	Ban Xia (Jiang)	G191H0526023	1
Phytocomm	Ban Xia (Jiang)	G191H0526121	6
PhytoComm	Ban Xia (Jiang)	G191H0526121	1
Phytocomm	Ban Xia (Jiang)	g191h0526121	1
Phytocomm	Ban Xia (Jiang)	G191H0526322	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ban Xia (Jiang)* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ban Xia (Jiang)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 076
Type B	0	155	0	13 388
Type C	0	1	10	1970

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.1290 %)
Type C	100.0000 % (> 99.4411 %)	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
61035	61035	0.00	17.71
61096	61096	0.00	15.13
61476	61476	0.00	19.35
61763	61763	0.00	11.88
61786	61786	0.00	14.91
61829	61829	0.00	13.55

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ban Zhi Lian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60038-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ban Zhi Lian; Scutellariae barbatae herba

Special notes

When selecting the *Ban Zhi Lian* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ban Zhi Lian	G224H0528521	61362	40	from supplier
PhytoComm	Ban Zhi Lian	G224H0528522	61921	40	from supplier
PhytoComm	Ban Zhi Lian	G224H0528522	61922	40	from supplier

Validation samples

A total of 36 840 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 *Ban Zhi Lian*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Ban Zhi Lian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ban Zhi Lian	G224H0528521	61362 [†]	20
PhytoComm	Ban Zhi Lian	G224H0528522	61921 [†]	20
PhytoComm	Ban Zhi Lian	G224H0528522	61922 [†]	20

- 13 483 spectra from a total of 316 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.

- 6 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Ban Zhi Lian*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ban Zhi Lian	G224H0528521	2
Phytocomm	Ban Zhi Lian	G224H0528221	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
Herbasin	Ban Zhi Lian	G224H0528022	1
PhytoComm	Ban Zhi Lian	H0528021	1
PhytoComm	Ban Zhi Lian	G224H0528521	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ban Zhi Lian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ban Zhi Lian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	3	3	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4417 %)	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
61362	61362	0.00	15.04
61921	61921	0.00	9.64
61922	61922	0.00	9.77

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bo He**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60073-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bo He; Menthae haplocalysis herba

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bo He	G158H1712421	61493	40	from supplier
PhytoComm	Bo He	G158H1712422	61766	40	from supplier

Validation samples

A total of 36 840 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 *Bo He*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Bo He*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bo He	G158H1712421	61201	75
PhytoComm	Bo He	G158H1712422	61766 [†]	20

- 13 448 spectra from a total of 316 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.

- 8 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Bo He*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bo He	G158H1712022	3
PhytoComm	Bo He	G158H1712022	2
Phytocomm	Bo He	g158h1712022	1
Phytocomm	Bo He	G158H1712121	1
PhytoComm	Bo He	G158H1712121	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*.

- 1973 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bo He* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bo He* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	95	0	13 448
Type C	12	0	8	1961

The substance/substance group *Bo He* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 93.6842 %)
Type C	99.4865 % (> 99.2072 %)	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
61493	61493	0.00	9.29
61766	61766	0.00	10.57

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Bu Gu Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60023-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bu Gu Zhi; Psoraleae corylifoliae fructus

Special notes

When selecting the *Bu Gu Zhi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Bu Gu Zhi	G205H1247421	61461	40	from supplier
PhytoComm	Bu Gu Zhi	G205H1247621	61939	40	from supplier
PhytoComm	Bu Gu Zhi	G205H1247621	61940	40	from supplier

Validation samples

A total of 36 840 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 *Bu Gu Zhi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Bu Gu Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Bu Gu Zhi	G205H1247421	61169	75
PhytoComm	Bu Gu Zhi	G205H1247621	61939 [†]	20
PhytoComm	Bu Gu Zhi	G205H1247621	61940 [†]	20

- 13 428 spectra from a total of 316 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.

- 9 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Bu Gu Zhi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Bu Gu Zhi	G205H1247421	2
Phytocomm	Bu Gu Zhi	G205H1247222	2
Phytocomm	Bu Gu Zhi	g205h1247222	1
PhytoComm	Bu Gu Zhi	H1247021	4

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

- 1972 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Bu Gu Zhi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Bu Gu Zhi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	1	2	7	1971

The substance/substance group *Bu Gu Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	99.6269 % (> 99.3475 %)	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
61461	61461	0.00	9.63
61939	61939	0.00	3.92
61940	61940	0.00	4.03

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Cang Er Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60054-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cang Er Zi; Xanthii fructus

Special notes

When selecting the *Cang Er Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Cang Er Zi	G251H1401622	61897	40	from supplier
PhytoComm	Cang Er Zi	G251H1401622	61898	40	from supplier

Validation samples

A total of 36 840 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 *Cang Er Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Cang Er Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Cang Er Zi	G251H1401622	61897 [†]	20
PhytoComm	Cang Er Zi	G251H1401622	61898 [†]	20

- 13 503 spectra from a total of 317 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.

- 14 spectra from 7 *Apo-Ident* customers from 7 batches from the substance/substance group *Cang Er Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Cang Er Zi	G251H1401021	2
PhytoComm	Cang Er Zi	(251)H1401021	1
PhytoComm	Cang Er Zi	G251H1401021	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
Phytocomm	Cang Er Zi	g251h1401021	1
Phytocomm	Cang Er Zi	G251H1401123	4
Phytocomm	Cang Er Zi	G251H1401322	2
Phytocomm	Cang Er Zi	H1401021	1
Phytocomm	Cang Er Zi	G251H1401521	1
PhytoComm	Cang Er Zi	H1401021	1

- 1967 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cang Er Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cang Er Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	14	1967

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4409 %)	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
61897	61897	0.00	21.03
61898	61898	0.00	21.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Cang Zhu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60160-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cang Zhu; Atractylodis rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Cang Zhu	G042H1402521	61767	40	from supplier
PhytoComm	Cang Zhu	G042H1402521	61800	40	from supplier
PhytoComm	Cang Zhu	G042H1402621	62087	40	from supplier
PhytoComm	Cang Zhu	G042H1402621	62088	40	from supplier

Validation samples

A total of 36 840 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 *Cang Zhu*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Cang Zhu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Cang Zhu	G042H1402521	61767 [†]	20
PhytoComm	Cang Zhu	G042H1402521	61800 [†]	20
PhytoComm	Cang Zhu	G042H1402621	62087 [†]	20
PhytoComm	Cang Zhu	G042H1402621	62088 [†]	20

- 13 463 spectra from a total of 316 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.

- 8 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Cang Zhu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Cang Zhu	G042H1402221	2

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
PhytoComm	Cang Zhu	G042H1402221	1
Phytocomm	Cang Zhu	g042h1402221	1
PhytoComm	Cang Zhu	G042H1402321	1
PhytoComm	Cang Zhu	H1402922	1
Phytocomm	Cang Zhu	H1402922	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cang Zhu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cang Zhu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	79	1	13 463
Type C	2	0	8	1971

The substance/substance group *Cang Zhu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	98.7500 % (> 95.0000 %)
Type C	99.8721 % (> 99.5928 %)	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
61767	61767	0.00	5.10
61800	61800	0.00	4.46
62087	62087	0.00	7.63
62088	62088	0.00	7.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ce Bai Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60313-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ce Bai Ye; Biotae orientalis cacumen

Special notes

When selecting the *Ce Bai Ye* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ce Bai Ye	G050HS245	61639	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ce Bai Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ce Bai Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ce Bai Ye	G050HS245	61639 [†]	20

- 13 523 spectra from a total of 317 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.

- 6 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Ce Bai Ye*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ce Bai Ye	G050HS245	1
PhytoComm	Ce Bai Ye	G050H0975021	1
Phytocomm	Ce Bai Ye	G050H0975021	1
Phytocomm	Ce Bai Ye	G050H0975321	1
phytocomm	Ce Bai Ye	g050h0975321	2

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

- 1975 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	1	20	0	13 522
Type C	0	0	6	1975

The substance/substance group *Ce Bai Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	99.9977 % (> 99.9627 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4417 %)	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
61639	61639	0.00	6.04

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chai Hu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60010-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chai Hu; Bupleuri radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chai Hu	G055H1055623	62043	40	from supplier
PhytoComm	Chai Hu	G055H1055623	62044	40	from supplier
PhytoComm	Chai Hu	G055H1055721	62099	40	from supplier
PhytoComm	Chai Hu	G055H1055721	62100	40	from supplier

Validation samples

A total of 36 840 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 *Chai Hu*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Chai Hu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chai Hu	G055H1055623	62043 [†]	20
PhytoComm	Chai Hu	G055H1055623	62044 [†]	20
PhytoComm	Chai Hu	G055H1055721	62099 [†]	20
PhytoComm	Chai Hu	G055H1055721	62100 [†]	20

- 13 463 spectra from a total of 316 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.

- 16 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Chai Hu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chai Hu	G055H1055422	5

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
PhytoComm	Chai Hu	G044H1055322	1
PhytoComm	Chai Hu	G055H1055123	1
Phytocomm	Chai Hu	G055H1055123	5
Phytocomm	Chai Hu	g055h1055123	1
PhytoComm	Chai Hu	G055H1055322	1
PhytoComm	Chai Hu	H1055022	1
Phytocomm	Chai Hu	H1055022	1

- 1965 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chai Hu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chai Hu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	8	2	14	1957

The substance/substance group *Chai Hu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.6519 % (> 99.3723 %)	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
62043	62043	0.00	10.99
62044	62044	0.00	10.45
62099	62099	0.00	8.48
62100	62100	0.00	8.85

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chan Tui**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60239-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chan Tui; Cicadae periostracum

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chan Tui	G067H1817323	61015	40	from supplier
PhytoComm	Chan Tui	G067H1817323	61565	40	from supplier

Validation samples

A total of 36 840 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 *Chan Tui*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Chan Tui*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chan Tui	G067H1817323	61274	75

- 13 468 spectra from a total of 317 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.

- 8 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Chan Tui*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chan Tui	G067H1817323	1
PhytoComm	Chan Tui	G067H1817323	1
Phytocomm	Chan Tui	G067H1817121	2
PhytoComm	Chan Tui	G067H1817322	1
Phytocomm	Chan Tui	G067H1817322	1
PhytoComm	Chan Tui	G06H1817121	1
phytocomm	Chan Tui	g067h1817322	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chan Tui* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chan Tui* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	75	0	13 468
Type C	2	4	4	1971

The substance/substance group *Chan Tui* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.8445 % (> 99.5652 %)	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
61015	61015	0.00	9.04
61565	61565	0.00	9.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Che Qian Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60255-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Che Qian Zi; Plantaginis semen

Special notes

When selecting the *Che Qian Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Che Qian Zi	G192H0723421	61078	40	from supplier
PhytoComm	Che Qian Zi	G192H0723323	61468	40	from supplier
PhytoComm	Che Qian Zi	G192H0723421	61473	40	from supplier
PhytoComm	Che Qian Zi	G192H0723621	61963	40	from supplier
PhytoComm	Che Qian Zi	G192H0723621	61964	40	from supplier

Validation samples

A total of 36 840 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 *Che Qian Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 210 spectra of 5 reference samples from the substance/substance group *Che Qian Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Che Qian Zi	G192H0723421	61078 [†]	20
PhytoComm	Che Qian Zi	G192H0723323	61176	75
PhytoComm	Che Qian Zi	G192H0723421	61181	75
PhytoComm	Che Qian Zi	G192H0723621	61963 [†]	20
PhytoComm	Che Qian Zi	G192H0723621	61964 [†]	20

- 13 333 spectra from a total of 315 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.

- 8 spectra from 7 *Apo-Ident* customers from 4 batches from the substance/substance group *Che Qian Zi*.

[†]These spectra were recorded from 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
PhytoComm	Che Qian Zi	G192H0723321	2
Phytocomm	Che Qian Zi	G192H0723421	2
Phytocomm	Che Qian Zi	410704805	1
PhytoComm	Che Qian Zi	410704805	1
Phytocomm	Che Qian Zi	G192H0723121	1
PhytoComm	Che Qian Zi	G192H0723121	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Che Qian Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Che Qian Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	209	1	13 333
Type C	1	2	6	1972

The substance/substance group *Che Qian Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	99.5238 % (> 98.0952 %)
Type C	99.9378 % (> 99.6585 %)	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
61078	61078	0.00	44.43
61468	61468	0.00	11.73
61473	61473	0.00	11.48
61963	61963	0.00	70.90
61964	61964	0.00	69.01

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chen Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60009-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chen Pi; Citri reticulatae pericarpium

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chen Pi	G073H1128621	61841	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Chen Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Chen Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chen Pi	G073H1128621	61841 [†]	20

- 13 523 spectra from a total of 317 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.

- 10 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Chen Pi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chen Pi	G073H1128221	1
Phytocomm	Chen Pi	G073H1128222	2
PhytoComm	Chen Pi	G073H1128221	1
PhytoComm	Chen Pi	G073H1128222	2
Phytocomm	Chen Pi	g073h1128222	1
Phytocomm	Chen Pi	g07h1128221	1
PhytoComm	Chen Pi	H1128922	1
phythocom	Chen Pi	g073h1128221	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*.

- 1971 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	38	2	21 275
Type B	7	20	0	13 516
Type C	3	0	10	1968

The substance/substance group *Chen Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9938 % (> 99.9743 %)	95.0000 % (> 87.5000 %)
Type B	99.9138 % (> 99.8788 %)	100.0000 % (> 70.0000 %)
Type C	99.8746 % (> 99.5952 %)	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
61841	61841	0.00	4.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chi Shao (Yao)**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60014-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chi Shao (Yao); Paeoniae radix rubra

Special notes

When selecting the *Chi Shao (Yao)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chi Shao (Yao)	G180H0705522	61779	40	from supplier
PhytoComm	Chi Shao (Yao)	G180H0705522	61821	40	from supplier
PhytoComm	Chi Shao (Yao)	G180H0705621	61965	40	from supplier
PhytoComm	Chi Shao (Yao)	G180H0705621	61966	40	from supplier

Validation samples

A total of 36 840 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 *Chi Shao (Yao)*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Chi Shao (Yao)*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chi Shao (Yao)	G180H0705522	61779 [†]	20
PhytoComm	Chi Shao (Yao)	G180H0705522	61821 [†]	20
PhytoComm	Chi Shao (Yao)	G180H0705621	61965 [†]	20
PhytoComm	Chi Shao (Yao)	G180H0705621	61966 [†]	20

- 13 463 spectra from a total of 316 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.

- 13 spectra from 7 *Apo-Ident* customers from 7 batches from the substance/substance group *Chi Shao (Yao)*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chi Shao (Yao)	G180H0705422	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
phytocomm	Chi Shao (Yao)	G180H0705121	2
Gehe	Chi Shao (Yao)	G180H0705121	1
PhytoComm	Chi Shao (Yao)	G180H0705122	2
Phytocomm	Chi Shao (Yao)	G180H0705122	2
Phytocomm	Chi Shao (Yao)	g180h0705122	1
Phytocomm	Chi Shao (Yao)	G180H0705321	1
PhytoComm	Chi Shao (Yao)	G180H0705321	1
Phytocomm	Chi Shao (Yao)	G180H0705121	1
Phytocomm	Chi Shao (Yao)	G189H0705321	1

- 1968 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chi Shao (Yao)* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chi Shao (Yao)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	4	1	12	1964

The substance/substance group *Chi Shao (Yao)* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.7388 % (> 99.4593 %)	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
61779	61779	0.00	12.54
61821	61821	0.00	12.17
61965	61965	0.00	13.72
61966	61966	0.00	13.52

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chuan Mu Tong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60173-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chuan Mu Tong; Clematidis armandii caulis

Special notes

When selecting the *Chuan Mu Tong* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chuan Mu Tong	G009H0310521	61732	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Chuan Mu Tong*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Chuan Mu Tong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chuan Mu Tong	G009H0310521	61732 [†]	20

- 13 523 spectra from a total of 317 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.

- 9 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Chuan Mu Tong*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chuan Mu Tong	G009H0310321	1
PhytoComm	Chuan Mu Tong	G009H0310521	1
phytoComm	Chuan Mu Tong	G009H0310121	3
PhytoComm	Chuan Mu Tong	G009H0310121	2
Phytocomm	Chuan Mu Tong	g009h0310321	1
PhytoComm	Chuan Mu Tong	H0310021	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*.

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	1	8	1971

The substance/substance group *Chuan Mu Tong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9254 % (> 99.6460 %)	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
61732	61732	0.00	7.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chuan Niu Xi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60122-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chuan Niu Xi; Cyathulae radix

Special notes

When selecting the *Chuan Niu Xi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chuan Niu Xi	G318H0431522	61788	40	from supplier
PhytoComm	Chuan Niu Xi	G318H0431522	61802	40	from supplier
PhytoComm	Chuan Niu Xi	G318H0431621	61883	40	from supplier
PhytoComm	Chuan Niu Xi	G318H0431621	61884	40	from supplier

Validation samples

A total of 36 840 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 *Chuan Niu Xi*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Chuan Niu Xi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chuan Niu Xi	G318H0431522	61788 [†]	20
PhytoComm	Chuan Niu Xi	G318H0431522	61802 [†]	20
PhytoComm	Chuan Niu Xi	G318H0431621	61883 [†]	20
PhytoComm	Chuan Niu Xi	G318H0431621	61884 [†]	20

- 13 463 spectra from a total of 316 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.

- 5 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Chuan Niu Xi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Chuan Niu Xi	G318H0431321	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
Phytocomm	Chuan Niu Xi	g318h0431321	1
PhytoComm	Chuan Niu Xi	H0431923	3

- 1976 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	159	1	21 156
Type B	0	80	0	13 463
Type C	2	0	5	1974

The substance/substance group *Chuan Niu Xi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	99.3750 % (> 97.5000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.8964 % (> 99.6174 %)	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
61788	61788	0.00	5.64
61802	61802	0.00	5.16
61883	61883	0.00	4.63
61884	61884	0.00	4.76

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chuan Xin Lian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60137-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chuan Xin Lian; Andrographitis herba

Special notes

When selecting the *Chuan Xin Lian* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chuan Xin Lian	G321FB0963421	61636	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Chuan Xin Lian*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 15 spectra of 1 reference samples from the substance/substance group *Chuan Xin Lian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chuan Xin Lian	G321FB0963421	61636 [†]	15

- 13 528 spectra from a total of 317 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.

- 2 spectra from 1 *Apo-Ident* customers from 2 batches from the substance/substance group *Chuan Xin Lian*.

Supplier	Substance	Batch	Spectra
PhytoComm	Chuan Xin Lian	G321FB0963321	1
PhytoComm	Chuan Xin Lian	H0963921	1

- 1979 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded 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 *Chuan Xin Lian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chuan Xin Lian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	15	0	13 528
Type C	1	2	0	1978

The substance/substance group *Chuan Xin Lian* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9303 %)	n/a (n/a)
Type C	99.9378 % (> 99.6601 %)	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
61636	61636	0.00	11.27

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chuan Xiong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60013-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chuan Xiong; Ligustici chuanxiong rhizoma; Ligustici wallichii radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chuan Xiong	G136H0305421	61521	40	from supplier
PhytoComm	Chuan Xiong	G136H0305321	61558	40	from supplier
PhytoComm	Chuan Xiong	G136H0305621	61975	40	from supplier
PhytoComm	Chuan Xiong	G136H0305621	61976	40	from supplier

Validation samples

A total of 36 840 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 *Chuan Xiong*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 190 spectra of 4 reference samples from the substance/substance group *Chuan Xiong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chuan Xiong	G136H0305421	61230	75
PhytoComm	Chuan Xiong	G136H0305321	61267	75
PhytoComm	Chuan Xiong	G136H0305621	61975 [†]	20
PhytoComm	Chuan Xiong	G136H0305621	61976 [†]	20

- 13 353 spectra from a total of 315 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.

- 12 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Chuan Xiong*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chuan Xiong	G136H0305421	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
Phytocomm	Chuan Xiong	G135H0305121	1
phytocomm	Chuan Xiong	G136H0305121	1
PhytoComm	Chuan Xiong	G136H0305121	1
Phytocomm	Chuan Xiong	G136H0305121	3
Phytocomm	Chuan Xiong	g136h0305121	1
PhytoComm	Chuan Xiong	G136H0305221	2
Phytocomm	Chuan Xiong	G136H0305221	1
Phytocomm	Chuan Xiong	G136H305121	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	160	0	21 155
Type B	0	189	1	13 353
Type C	15	4	8	1954

The substance/substance group *Chuan Xiong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9969 % (> 99.9773 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	99.4737 % (> 97.8947 %)
Type C	98.8294 % (> 98.5499 %)	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
61521	61521	0.00	5.32
61558	61558	0.00	8.63
61975	61975	0.00	6.25
61976	61976	0.00	6.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Chuang Mu Xiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50323-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chuang Mu Xiang; Vladimira radix

Special notes

When selecting the *Chuang Mu Xiang* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Chuang Mu Xiang	G219H0309521	61661	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Chuang Mu Xiang*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Chuang Mu Xiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Chuang Mu Xiang	G219H0309521	61661 [†]	20

- 13 523 spectra from a total of 317 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.

- 7 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Chuang Mu Xiang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Chuang Mu Xiang	G219H0309521	2
phytocomm	Chuang Mu Xiang	G219H0309021	1
PhytoComm	Chuang Mu Xiang	G219H0309021	1
Phytocomm	Chuang Mu Xiang	g219h0309321	1
Phytocomm	Chuang Mu Xiang	G219H0309322	1
Phytocomm	Chuang Mu Xiang	g219h0309322	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	19	1	13 523
Type C	3	1	6	1971

The substance/substance group *Chuang Mu Xiang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	95.0000 % (> 80.0000 %)
Type C	99.8383 % (> 99.5591 %)	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
61661	61661	0.00	6.41

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ci Wu Jia**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60354-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ci Wu Jia; Acanthopanax (senticosi) radix; Eleutherococci radix

Special notes

When selecting the *Ci Wu Jia* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ci Wu Jia	G302H0856521	61784	40	from supplier
PhytoComm	Ci Wu Jia	G302H0856521	61812	40	from supplier

Validation samples

A total of 36 840 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 *Ci Wu Jia*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ci Wu Jia*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ci Wu Jia	G302H0856521	61784 [†]	20
PhytoComm	Ci Wu Jia	G302H0856521	61812 [†]	20

- 13 503 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Ci Wu Jia*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ci Wu Jia	G302H0856022	1
Phytocomm	Ci Wu Jia	G302H0856121	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*.

- 1979 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ci Wu Jia* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ci Wu Jia* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	2	1977

The substance/substance group *Ci Wu Jia* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9194 % (> 99.6417 %)	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
61784	61784	0.00	6.42
61812	61812	0.00	6.68

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Cong Bai**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60467-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cong Bai; Allii fistulosi bulbus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Cong Bai	G012H1255521	61708	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Cong Bai*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Cong Bai*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Cong Bai	G012H1255521	61708 [†]	20

- 13 523 spectra from a total of 317 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.

- 2 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Cong Bai*.

Supplier	Substance	Batch	Spectra
Bios	Cong Bai	424348	2

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Cong Bai* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cong Bai* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	2	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61708	61708	0.00	14.55

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Da Qing Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60256-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Da Qing Ye; Isatidis folium

Special notes

When selecting the *Da Qing Ye* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Da Qing Ye	G127H0318621	62003	40	from supplier
PhytoComm	Da Qing Ye	G127H0318621	62004	40	from supplier

Validation samples

A total of 36 840 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 *Da Qing Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Da Qing Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Da Qing Ye	G127H0318621	62003 [†]	20
PhytoComm	Da Qing Ye	G127H0318621	62004 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Da Qing Ye*.

Supplier	Substance	Batch	Spectra
PhytoComm	Da Qing Ye	4103167001	1
phytoComm	Da Qing Ye	410316901	1
Herbasin	Da Qing Ye	G127H0318121	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
Phytocomm	Da Qing Ye	G127H0318121	1
PhytoComm	Da Qing Ye	G127H0318121	1
Phytocomm	Da Qing Ye	G127H0318421	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Da Qing Ye* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Da Qing Ye* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	0	7	1973

The substance/substance group *Da Qing Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9067 % (> 99.6275 %)	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
62003	62003	0.00	17.87
62004	62004	0.00	17.68

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Da Zao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60055-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Da Zao; Zizyphi jujubae fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Da Zao	G129H0316321	61034	50	from supplier
PhytoComm	Da Zao	G129H0316321	61526	40	from supplier
PhytoComm	Da Zao	G129H0316521	61730	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 130 spectra of 3 reference samples from the substance/substance group *Da Zao*. These samples are listed above in the [calibration samples](#) section.
- 21 186 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 105 spectra of 3 reference samples from the substance/substance group *Da Zao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Da Zao	G129H0316321	61034 [†]	10
PhytoComm	Da Zao	G129H0316321	61235	75
PhytoComm	Da Zao	G129H0316521	61730 [†]	20

- 13 438 spectra from a total of 316 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.

- 16 spectra from 7 *Apo-Ident* customers from 4 batches from the substance/substance group *Da Zao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Da Zao	G129H0316521	3
phytocomm	Da Zao	G129H0316121	2

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
PhytoComm	Da Zao	G129H0316121	1
Phytocomm	Da Zao	G129H0316121	5
PhytoComm	Da Zao	G129H0316221	1
Phytocomm	Da Zao	G129H0316221	3
Phytocomm	Da Zao	g129h0316221	1

- 1965 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Da Zao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Da Zao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 186
Type B	0	105	0	13 438
Type C	23	8	8	1942

The substance/substance group *Da Zao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.3846 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 94.2857 %)
Type C	99.0871 % (> 98.8076 %)	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
61034	61034	0.00	10.73
61526	61526	0.00	9.39
61730	61730	0.00	10.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dan Dou Chi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60794-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dan Dou Chi; Sojae semen praeparatum

Special notes

When selecting the *Dan Dou Chi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dan Dou Chi	G232HS239	61641	40	from supplier
PhytoComm	Dan Dou Chi	G232H1106621	61909	40	from supplier
PhytoComm	Dan Dou Chi	G232H1106621	61910	40	from supplier

Validation samples

A total of 36 840 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 *Dan Dou Chi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Dan Dou Chi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dan Dou Chi	G232HS239	61641 [†]	20
PhytoComm	Dan Dou Chi	G232H1106621	61909 [†]	20
PhytoComm	Dan Dou Chi	G232H1106621	61910 [†]	20

- 13 483 spectra from a total of 316 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.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Dan Dou Chi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Dan Dou Chi	G232HS239	1
PhytoComm	Dan Dou Chi	G232H1106321	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*.

- 1979 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dan Dou Chi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dan Dou Chi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	1	1	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61641	61641	0.00	24.46
61909	61909	0.00	51.15
61910	61910	0.00	53.03

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dan Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60030-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dan Shen; Salviae miltiorrhizae radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dan Shen	G214H0441324	61007	20	from supplier
PhytoComm	Dan Shen	G214H0441422	61367	40	from supplier
PhytoComm	Dan Shen	G214H0441324	61448	40	from supplier
PhytoComm	Dan Shen	G214H0441522	61731	40	from supplier
PhytoComm	Dan Shen	G214H0441522	62063	40	from supplier
PhytoComm	Dan Shen	G214H0441522	62064	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 220 spectra of 6 reference samples from the substance/substance group *Dan Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 096 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 155 spectra of 5 reference samples from the substance/substance group *Dan Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dan Shen	G214H0441324	61156	75
PhytoComm	Dan Shen	G214H0441422	61367 [†]	20
PhytoComm	Dan Shen	G214H0441522	61731 [†]	20
PhytoComm	Dan Shen	G214H0441522	62063 [†]	20
PhytoComm	Dan Shen	G214H0441522	62064 [†]	20

- 13 388 spectra from a total of 315 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.

- 16 spectra from 8 *Apo-Ident* customers from 5 batches from the substance/substance group *Dan Shen*.

[†]These spectra were recorded from 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
Phytocomm	Dan Shen	G214H0441522	1
PhytoComm	Dan Shen	G214H0441522	1
Phytocomm	Dan Shen	G214H0441121	5
PhytoComm	Dan Shen	G214H0441221	2
Phytocomm	Dan Shen	g214h0441121	1
PhytoComm	Dan Shen	G214H0441121	2
Phytocomm	Dan Shen	G214H0441221	1
Phytocomm	Dan Shen	G214H0441322	1
PhytoComm	Dan Shen	G214H0441322	2

- 1965 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	220	0	21 096
Type B	0	155	0	13 388
Type C	3	12	4	1962

The substance/substance group *Dan Shen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.2727 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.1290 %)
Type C	99.8756 % (> 99.5961 %)	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
61007	61007	0.00	9.74
61367	61367	0.00	5.74
61448	61448	0.00	8.04
61731	61731	0.00	9.20
62063	62063	0.00	11.58
62064	62064	0.00	11.65

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dan Zhu Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60147-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dan Zhu Ye; Lophatheri gracilis herba

Special notes

When selecting the *Dan Zhu Ye* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dan Zhu Ye	G046H1105621	62105	40	from supplier
PhytoComm	Dan Zhu Ye	G046H1105621	62106	40	from supplier

Validation samples

A total of 36 840 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 *Dan Zhu Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Dan Zhu Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dan Zhu Ye	G046H1105621	62105 [†]	20
PhytoComm	Dan Zhu Ye	G046H1105621	62106 [†]	20

- 13 503 spectra from a total of 317 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.

- 10 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Dan Zhu Ye*.

Supplier	Substance	Batch	Spectra
Phytocomm	Dan Zhu Ye	G046H1105021	2
PhytoComm	Dan Zhu Ye	G046H1105021	1
Phytocomm	Dan Zhu Ye	G046H1105321	4
Phytocomm	Dan Zhu Ye	G046H110521	1
PhytoComm	Dan Zhu Ye	H1105921	2

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

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dan Zhu Ye* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dan Zhu Ye* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	5	3	7	1966

The substance/substance group *Dan Zhu Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.4181 % (> 99.1387 %)	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
62105	62105	0.00	4.43
62106	62106	0.00	6.12

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dang Gui**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60003-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dang Gui; Angelicae sinensis radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dang Gui	G022H1306621	61835	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Dang Gui*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Dang Gui*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dang Gui	G022H1306621	61835 [†]	20

- 13 523 spectra from a total of 317 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.

- 19 spectra from 9 *Apo-Ident* customers from 8 batches from the substance/substance group *Dang Gui*.

Supplier	Substance	Batch	Spectra
Phytocomm	Dang Gui	G022H1306422	2
PhytoComm	Dang Gui	G022H1306621	2
PhytoComm	Dang Gui	G022H1306022	2
Phytocomm	Dang Gui	G022H1306022	5
Phytocomm	Dang Gui	G022H1306121	1
Phytocomm	Dang Gui	G022H1306023	1
PhytoComm	Dang Gui	G022H1306121	1
Phytocomm	Dang Gui	g022h1306121	3
PhytoComm	Dang Gui	G022H1306321	1
PhytoComm	Dang Gui	G13-0784	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*.

- 1962 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	1	20	0	13 522
Type C	3	0	19	1959

The substance/substance group *Dang Gui* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	99.9974 % (> 99.9624 %)	100.0000 % (> 70.0000 %)
Type C	99.8653 % (> 99.5856 %)	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
61835	61835	0.00	9.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dang Gui Wei**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60308-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dang Gui Wei; Angelicae sinensis radix extremis

Special notes

When selecting the *Dang Gui Wei* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dang Gui Wei	G312H1307522	61676	40	from supplier
PhytoComm	Dang Gui Wei	G312H1307621	61885	40	from supplier
PhytoComm	Dang Gui Wei	G312H1307621	61886	40	from supplier

Validation samples

A total of 36 840 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 *Dang Gui Wei*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Dang Gui Wei*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dang Gui Wei	G312H1307522	61676 [†]	20
PhytoComm	Dang Gui Wei	G312H1307621	61885 [†]	20
PhytoComm	Dang Gui Wei	G312H1307621	61886 [†]	20

- 13 483 spectra from a total of 316 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.

- 8 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Dang Gui Wei*.

Supplier	Substance	Batch	Spectra
PhytoComm	Dang Gui Wei	(G312)H1307021	1
Phytocomm	Dang Gui Wei	G312H1307021	5
PhytoComm	Dang Gui Wei	G312H1307021	2

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

- 1973 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	119	1	21 196
Type B	0	60	0	13 483
Type C	3	1	7	1970

The substance/substance group *Dang Gui Wei* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	99.1667 % (> 96.6667 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.9129 % (> 99.6336 %)	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
61676	61676	0.00	7.39
61885	61885	0.00	5.98
61886	61886	0.00	5.74

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dang Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60000-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dang Shen; Codonopsis pilosulae radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dang Shen	G077H2001621	62021	40	from supplier
PhytoComm	Dang Shen	G077H2001621	62022	40	from supplier

Validation samples

A total of 36 840 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 *Dang Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Dang Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dang Shen	G077H2001621	62021 [†]	20
PhytoComm	Dang Shen	G077H2001621	62022 [†]	20

- 13 503 spectra from a total of 317 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.

- 14 spectra from 9 *Apo-Ident* customers from 6 batches from the substance/substance group *Dang Shen*.

Supplier	Substance	Batch	Spectra
PhytoComm	Dang Shen	G077H2001521	2
PhytoComm	Dang Shen	G077H2001521	2
PhytoComm	Dang Shen	G077H2001022	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
Phytocomm	Dang Shen	G077H2001022	1
Phytocomm	Dang Shen	G077H2001222	1
PhytoComm	Dang Shen	G077H2001222	1
PhytoComm	Dang Shen	g077H2001222	1
EuRho	Dang Shen	g077h2001222	2
PhytoComm	Dang Shen	H2001021	2
Phytocomm	Dang Shen	H2001021	1

- 1967 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dang Shen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dang Shen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	3	3	11	1964

The substance/substance group *Dang Shen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8622 % (> 99.5827 %)	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
62021	62021	0.00	7.70
62022	62022	0.00	7.44

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Di Fu Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60043-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Di Fu Zi; Kochiae scopariae fructus

Special notes

When selecting the *Di Fu Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Di Fu Zi	G131H0605522	61667	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Di Fu Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Di Fu Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Di Fu Zi	G131H0605522	61667 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Di Fu Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Di Fu Zi	G131H0605021	1
PhytoComm	Di Fu Zi	G131H0605122	2
Phytocomm	Di Fu Zi	G131H0605122	2

- 1976 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 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 *Di Fu Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Di Fu Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
61667	61667	0.00	70.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Di Gu Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60036-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Di Gu Pi; Lycii chinensis radicis cortex

Special notes

When selecting the *Di Gu Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Di Gu Pi	G149H0601421	61499	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Di Gu Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Di Gu Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Di Gu Pi	G149H0601421	61207	75

- 13 468 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Di Gu Pi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Di Gu Pi	G149H0601421	1
PhytoComm	Di Gu Pi	G149H0601421	2
Phytocomm	Di Gu Pi	g149h060112	1
PhytoComm	Di Gu Pi	G149H0601122	2
Phytocomm	Di Gu Pi	G149H0601122	1
Phytocomm	Di Gu Pi	G149H0601822	1
PhytoComm	Di Gu Pi	H0601821	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	75	0	13 468
Type C	4	3	6	1968

The substance/substance group *Di Gu Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.8313 % (> 99.5520 %)	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
61499	61499	0.00	10.03

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Di Long**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60061-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Di Long; Lumbricus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Di Long	G148H0603421	61653	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Di Long*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Di Long*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Di Long	G148H0603421	61653 [†]	20

- 13 523 spectra from a total of 317 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.

- 9 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Di Long*.

Supplier	Substance	Batch	Spectra
Phytocomm	Di Long	G148H0603421	1
PhytoComm	Di Long	G148H0603421	1
PhytoComm	Di Long	G148H0603022	2
Phytocomm	Di Long	G148H0603022	1
Phytocomm	Di Long	G148H0603321	2
PhytoComm	Di Long	G148H603321	1
phytocomm	Di Long	g148h603321	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*.

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	4	5	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4413 %)	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
61653	61653	0.00	23.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dong Gua Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60202-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dong Gua Zi; Benincasae hispidae semen

Special notes

When selecting the *Dong Gua Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dong Gua Zi	G049H0551622	62015	40	from supplier
PhytoComm	Dong Gua Zi	G049H0551622	62016	40	from supplier

Validation samples

A total of 36 840 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 *Dong Gua Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Dong Gua Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dong Gua Zi	G049H0551622	62015 [†]	20
PhytoComm	Dong Gua Zi	G049H0551622	62016 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 2 batches from the substance/substance group *Dong Gua Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Dong Gua Zi	G049H0551221	5
Phytocomm	Dong Gua Zi	G049H0551021	1
PhytoComm	Dong Gua Zi	G049H0551221	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dong Gua Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dong Gua Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	1	6	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4415 %)	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
62015	62015	0.00	13.47
62016	62016	0.00	13.24

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Dong Kui Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60483-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dong Kui Zi; Abutili semen; Malvae semen

Special notes

When selecting the *Dong Kui Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Dong Kui Zi	G001H0834721	62089	40	from supplier
PhytoComm	Dong Kui Zi	G001H0834721	62090	40	from supplier

Validation samples

A total of 36 840 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 *Dong Kui Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Dong Kui Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Dong Kui Zi	G001H0834721	62089 [†]	20
PhytoComm	Dong Kui Zi	G001H0834721	62090 [†]	20

- 13 503 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Dong Kui Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Dong Kui Zi	G001BP030505	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*.

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dong Kui Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dong Kui Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	1	1980

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4487 %)	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
62089	62089	0.00	24.45
62090	62090	0.00	24.28

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Du Huo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50259-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Du Huo; Angelicae pubescentis radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Du Huo	G021H1610421	61616	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Du Huo*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Du Huo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Du Huo	G021H1610421	61325	75

- 13 468 spectra from a total of 317 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.

- 9 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Du Huo*.

Supplier	Substance	Batch	Spectra
Phytocomm	Du Huo	421605602	2
Phytocomm	Du Huo	G021H1610421	2
PhytoComm	Du Huo	G021H1610221	1
Phytocomm	Du Huo	g021h610221	1
PhytoComm	Du Huo	H1610922	1
Phytocomm	Du Huo	H1610922	2

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	6	75	0	13 462
Type C	3	2	7	1969

The substance/substance group *Du Huo* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	99.9462 % (> 99.9109 %)	100.0000 % (> 92.0000 %)
Type C	99.9238 % (> 99.6445 %)	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
61616	61616	0.00	11.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Du Zhong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60214-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Du Zhong; Eucommiae ulmoidis cortex

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Du Zhong	G101H0736522	61722	40	from supplier
PhytoComm	Du Zhong	G101H0736621	61997	40	from supplier
PhytoComm	Du Zhong	G101H0736621	61998	40	from supplier

Validation samples

A total of 36 840 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 *Du Zhong*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Du Zhong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Du Zhong	G101H0736522	61722 [†]	20
PhytoComm	Du Zhong	G101H0736621	61997 [†]	20
PhytoComm	Du Zhong	G101H0736621	61998 [†]	20

- 13 483 spectra from a total of 316 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 8 *Apo-Ident* customers from 7 batches from the substance/substance group *Du Zhong*.

Supplier	Substance	Batch	Spectra
Phytocomm	Du Zhong	G101H0736522	5
PhytoComm	Du Zhong	G101H0736021	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
Phytocomm	Du Zhong	G101H0736021	1
Phytocomm	Du Zhong	g101h0736021	1
Phytocomm	Du Zhong	G101H0736321	1
PhytoComm	Du Zhong	G101H0736321	1
Phytocomm	Du Zhong	g101h076521	1
PhytoComm	Du Zhong	H0736021	3
Phytocomm	Du Zhong	H0736923	1

- 1966 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Du Zhong* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Du Zhong* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	2	8	7	1964

The substance/substance group *Du Zhong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.9378 % (> 99.6583 %)	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
61722	61722	0.00	7.35
61997	61997	0.00	8.38
61998	61998	0.00	8.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **E Zhu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50344-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

E Zhu; Curcumae zedoariae rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	E Zhu	G083H1110521	61741	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *E Zhu*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *E Zhu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	E Zhu	G083H1110521	61741 [†]	20

- 13 523 spectra from a total of 317 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.

- 8 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *E Zhu*.

Supplier	Substance	Batch	Spectra
PhytoComm	E Zhu	(083)H1110021	1
Phytocomm	E Zhu	G083H111022	1
PhytoComm	E Zhu	G083H1110222	1
PhytoComm	E Zhu	H1110021	2
Phytocomm	E Zhu	H1110021	2
Phytocomm	E Zhu	h1110021	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*.

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	0	8	1972

The substance/substance group *E Zhu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9661 % (> 99.6868 %)	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
61741	61741	0.00	9.91

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fang Feng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50261-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fang Feng; Saposhnikovia radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fang Feng	G217H0728521	61657	40	from supplier
PhytoComm	Fang Feng	G217H0728521	62053	40	from supplier
PhytoComm	Fang Feng	G217H0728521	62054	40	from supplier

Validation samples

A total of 36 840 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 *Fang Feng*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Fang Feng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fang Feng	G217H0728521	61657 [†]	20
PhytoComm	Fang Feng	G217H0728521	62053 [†]	20
PhytoComm	Fang Feng	G217H0728521	62054 [†]	20

- 13 483 spectra from a total of 317 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.

- 19 spectra from 9 *Apo-Ident* customers from 8 batches from the substance/substance group *Fang Feng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Fang Feng	G217H0728521	3
PhytoComm	Fang Feng	G217H0728521	2

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
Phytocomm	Fang Feng	G217H0728221	1
PhytoComm	Fang Feng	G217H0728221	1
Phytocomm	Fang Feng	g217h0728221	1
Phytocomm	Fang Feng	G217H0728923	4
PhytoComm	Fang Feng	G217H0728923	1
Phytocomm	Fang Feng	g217h0728923	1
Phytocomm	Fang Feng	G217H728923	1
Phytocomm	Fang Feng	G21H0728923	1
phytocomm	Fang Feng	H0728922	1
Phytocomm	Fang Feng	H0728922	1
phythocom	Fang Feng	G217H0728923	1

- 1962 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fang Feng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fang Feng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	59	1	13 483
Type C	35	5	14	1927

The substance/substance group *Fang Feng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	98.3333 % (> 93.3333 %)
Type C	98.6654 % (> 98.3858 %)	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
61657	61657	0.00	7.03
62053	62053	0.00	8.18
62054	62054	0.00	8.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fo Shou**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60119-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fo Shou; Citri sarcodactylis fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fo Shou	G307HS159PM1	61865	40	from supplier
PhytoComm	Fo Shou	G307HS159PM1	61866	40	from supplier

Validation samples

A total of 36 840 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 *Fo Shou*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Fo Shou*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fo Shou	G307HS159PM1	61865 [†]	20
PhytoComm	Fo Shou	G307HS159PM1	61866 [†]	20

- 13 503 spectra from a total of 317 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.

- 4 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Fo Shou*.

Supplier	Substance	Batch	Spectra
phytocomm	Fo Shou	44503	1
Phytocomm	Fo Shou	G307H0888321	1
phytocomm	Fo Shou	H0888021	1
PhytoComm	Fo Shou	H0888021	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*.

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fo Shou* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fo Shou* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	0	4	1976

The substance/substance group *Fo Shou* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9751 % (> 99.6963 %)	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
61865	61865	0.00	8.73
61866	61866	0.00	9.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fu Ling**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50260-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fu Ling; Poriae cocos sclerotium

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fu Ling	G200HS211	61869	40	from supplier
PhytoComm	Fu Ling	G200HS211	61870	40	from supplier
PhytoComm	Fu Ling	G200H1019622	61961	40	from supplier
PhytoComm	Fu Ling	G200H1019622	61962	40	from supplier

Validation samples

A total of 36 840 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 *Fu Ling*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Fu Ling*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fu Ling	G200HS211	61869 [†]	20
PhytoComm	Fu Ling	G200HS211	61870 [†]	20
PhytoComm	Fu Ling	G200H1019622	61961 [†]	20
PhytoComm	Fu Ling	G200H1019622	61962 [†]	20

- 13 463 spectra from a total of 316 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.

- 18 spectra from 11 *Apo-Ident* customers from 5 batches from the substance/substance group *Fu Ling*.

Supplier	Substance	Batch	Spectra
PhytoComm	Fu Ling	421001902	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
Phyto Comm	Fu Ling	G200H1019522	1
Phytocomm	Fu Ling	G200H1019522	2
PhytoComm	Fu Ling	G200H1019522	1
PhytoComm	Fu Ling	G200H1019221	3
Phytocomm	Fu Ling	G200H1019221	4
Phytocomm	Fu Ling	G200H1019321	1
PhytoComm	Fu Ling	G200H1019321	2
Phytocomm	Fu Ling	g200h1019321	3

- 1963 spectra from 15 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fu Ling* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fu Ling* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	0	6	12	1963

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.4408 %)	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
61869	61869	0.00	9.92
61870	61870	0.00	10.11
61961	61961	0.00	12.27
61962	61962	0.00	12.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fu Pen Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60044-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fu Pen Zi; Rubi chingii fructus

Special notes

When selecting the *Fu Pen Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fu Pen Zi	G213H1813422	61449	40	from supplier
PhytoComm	Fu Pen Zi	G213H1813621	61780	40	from supplier
PhytoComm	Fu Pen Zi	G213H1813621	61803	40	from supplier

Validation samples

A total of 36 840 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 *Fu Pen Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Fu Pen Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fu Pen Zi	G213H1813422	61157	75
PhytoComm	Fu Pen Zi	G213H1813621	61780 [†]	20
PhytoComm	Fu Pen Zi	G213H1813621	61803 [†]	20

- 13 428 spectra from a total of 316 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.

- 3 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Fu Pen Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Fu Pen Zi	G213H1813122	1
Phytocomm	Fu Pen Zi	g213h1813122	1
PhytoComm	Fu Pen Zi	H1813021	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*.

- 1978 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fu Pen Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fu Pen Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	3	1	2	1975

The substance/substance group *Fu Pen Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	99.8756 % (> 99.5972 %)	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
61449	61449	0.00	14.23
61780	61780	0.00	16.83
61803	61803	0.00	17.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fu Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60004-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fu Shen; Poriae cocos sclerotium paradicis

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fu Shen	G201HS212	61638	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Fu Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Fu Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fu Shen	G201HS212	61638 [†]	20

- 13 523 spectra from a total of 317 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.

- 8 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Fu Shen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Fu Shen	G201H1021422	2
PhytoComm	Fu Shen	G201F110526	1
Phytocomm	Fu Shen	G201H1021321	2
Phytocomm	Fu Shen	G201F110526	1
Phytocomm	Fu Shen	g201h1021321	1
phythocom	Fu Shen	G201H1021321	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*.

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	40	0	21 275
Type B	2	18	2	13 521
Type C	0	0	8	1973

The substance/substance group *Fu Shen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9938 % (> 99.9743 %)	100.0000 % (> 85.0000 %)
Type B	99.9754 % (> 99.9404 %)	90.0000 % (> 75.0000 %)
Type C	100.0000 % (> 99.4414 %)	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
61638	61638	0.00	4.25

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fu Xiao Mai**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60081-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fu Xiao Mai; Triticum aestivum semen levis

Special notes

When selecting the *Fu Xiao Mai* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fu Xiao Mai	G244H1078421	61428	40	from supplier
PhytoComm	Fu Xiao Mai	G244HS0210V1	61855	40	from supplier
PhytoComm	Fu Xiao Mai	G244HS0210V1	61856	40	from supplier

Validation samples

A total of 36 840 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 *Fu Xiao Mai*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Fu Xiao Mai*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fu Xiao Mai	G244H1078421	61136	75
PhytoComm	Fu Xiao Mai	G244HS0210V1	61855 [†]	20
PhytoComm	Fu Xiao Mai	G244HS0210V1	61856 [†]	20

- 13 428 spectra from a total of 316 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.

- 3 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Fu Xiao Mai*.

Supplier	Substance	Batch	Spectra
Phytocomm	Fu Xiao Mai	G244H1078121	1
phytocomm	Fu Xiao Mai	H1078021	1
Phytocomm	Fu Xiao Mai	H1078021	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*.

- 1978 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fu Xiao Mai* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fu Xiao Mai* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	0	0	3	1978

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.4431 %)	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
61428	61428	0.00	16.14
61855	61855	0.00	8.51
61856	61856	0.00	6.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Fu Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50884-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fu Zi; Aconiti lateralis radix praeparata; Aconiti radix lateralis praep.

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Fu Zi	G005H0801123	61342	40	from supplier
PhytoComm	Fu Zi	G005H0801123	61621	40	from supplier
PhytoComm	Fu Zi	G005H0801524	61728	40	from supplier
PhytoComm	Fu Zi	G005H0801524	62071	40	from supplier
PhytoComm	Fu Zi	G005H0801524	62072	40	from supplier
PhytoComm	Fu Zi	G005H0801624	62081	40	from supplier
PhytoComm	Fu Zi	G005H0801624	62082	40	from supplier

Validation samples

A total of 36 840 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 *Fu Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 036 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 195 spectra of 7 reference samples from the substance/substance group *Fu Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Fu Zi	G005H0801123	61330	75
PhytoComm	Fu Zi	G005H0801123	61342 [†]	20
PhytoComm	Fu Zi	G005H0801524	61728 [†]	20
PhytoComm	Fu Zi	G005H0801524	62071 [†]	20
PhytoComm	Fu Zi	G005H0801524	62072 [†]	20
PhytoComm	Fu Zi	G005H0801624	62081 [†]	20
PhytoComm	Fu Zi	G005H0801624	62082 [†]	20

- 13 348 spectra from a total of 315 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.

- 13 spectra from 7 *Apo-Ident* customers from 7 batches from the substance/substance group *Fu Zi*.

[†]These spectra were recorded from 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
phythocom	Fu Zi	goo5h0801122	1
Phytocomm	Fu Zi	161213fz	1
Phytocomm	Fu Zi	G005H0801524	1
Phytocomm	Fu Zi	G005H0801122	6
PhytoComm	Fu Zi	G005H0801122	1
Phytocomm	Fu Zi	g005h0801122	1
Phytocomm	Fu Zi	G005H0801322	1
phytocomm	Fu Zi	g005h0801322	1

- 1968 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	280	0	21 035
Type B	0	192	3	13 348
Type C	9	2	11	1959

The substance/substance group *Fu Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9876 % (> 99.9680 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9294 %)	98.4615 % (> 96.9231 %)
Type C	99.3612 % (> 99.0817 %)	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
61342	61342	0.00	8.50
61621	61621	0.00	7.03
61728	61728	0.00	10.34
62071	62071	0.00	12.36
62072	62072	0.00	12.54
62081	62081	0.00	8.77
62082	62082	0.00	9.24

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gan Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60011-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gan Cao; Glycyrrhizae radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gan Cao	G119H0521524	61977	40	from supplier
PhytoComm	Gan Cao	G119H0521524	61978	40	from supplier

Validation samples

A total of 36 840 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 *Gan Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Gan Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gan Cao	G119H0521524	61977 [†]	20
PhytoComm	Gan Cao	G119H0521524	61978 [†]	20

- 13 503 spectra from a total of 317 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.

- 13 spectra from 8 *Apo-Ident* customers from 4 batches from the substance/substance group *Gan Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gan Cao	G119H0521522	7
Phytocomm	Gan Cao	G119H0521121	3
PhytoComm	Gan Cao	G119H0521121	1
Phytocomm	Gan Cao	g119h0521121	1
PhytoComm	Gan Cao	H0521923	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*.

- 1968 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gan Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gan Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	4	9	1968

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4410 %)	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
61977	61977	0.00	16.76
61978	61978	0.00	16.66

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gan Jiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60077-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gan Jiang; Zingiberis rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gan Jiang	G252H1145521	61743	40	from supplier
PhytoComm	Gan Jiang	G252H1145621	61895	40	from supplier
PhytoComm	Gan Jiang	G252H1145621	61896	40	from supplier

Validation samples

A total of 36 840 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 *Gan Jiang*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Gan Jiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gan Jiang	G252H1145521	61743 [†]	20
PhytoComm	Gan Jiang	G252H1145621	61895 [†]	20
PhytoComm	Gan Jiang	G252H1145621	61896 [†]	20

- 13 483 spectra from a total of 316 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.

- 12 spectra from 8 *Apo-Ident* customers from 7 batches from the substance/substance group *Gan Jiang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gan Jiang	G252H1145521	1
Phytocomm	Gan Jiang	g252h01145221	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
PhytoComm	Gan Jiang	G252H1145221	1
Caelo	Gan Jiang	G252H1145221	1
Phytocomm	Gan Jiang	G252H1145221	2
Phytocomm	Gan Jiang	H1145021	1
PhytoComm	Gan Jiang	H1145021	1
phythocom	Gan Jiang	G252H1145221	1
phythocom	Gan Jiang	252h1145021	1
phythocom	Gan Jiang	g252h1145221	1
phythocom	Gan Jiang	G25H1145221	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	119	1	21 196
Type B	0	60	0	13 483
Type C	6	1	11	1963

The substance/substance group *Gan Jiang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	99.1667 % (> 96.6667 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.7550 % (> 99.4755 %)	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
61743	61743	0.00	4.75
61895	61895	0.00	6.25
61896	61896	0.00	6.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ge Gen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60050-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ge Gen; Puerariae radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ge Gen	G206H1301422	61086	40	from supplier
PhytoComm	Ge Gen	G206H1301422	61457	40	from supplier
PhytoComm	Ge Gen	G206H1301621	61949	40	from supplier
PhytoComm	Ge Gen	G206H1301621	61950	40	from supplier

Validation samples

A total of 36 840 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 *Ge Gen*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Ge Gen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ge Gen	G206H1301422	61086 [†]	20
PhytoComm	Ge Gen	G206H1301422	61165	75
PhytoComm	Ge Gen	G206H1301621	61949 [†]	20
PhytoComm	Ge Gen	G206H1301621	61950 [†]	20

- 13 408 spectra from a total of 316 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.

- 9 spectra from 7 *Apo-Ident* customers from 4 batches from the substance/substance group *Ge Gen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ge Gen	161213gg	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
Phytocomm	Ge Gen	G206H1301422	2
phytocomm	Ge Gen	FA1301902	1
Phytocomm	Ge Gen	FA1301902	2
PhytoComm	Ge Gen	FA1301902	1
Phytocomm	Ge Gen	G206H1301221	2

- 1972 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ge Gen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ge Gen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	135	0	13 408
Type C	0	2	7	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	100.0000 % (> 99.4413 %)	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
61086	61086	0.00	17.04
61457	61457	0.00	18.16
61949	61949	0.00	27.76
61950	61950	0.00	28.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gou Qi Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60094-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gou Qi Zi; Lycii chinensis fructus

Special notes

When selecting the *Gou Qi Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gou Qi Zi	G150H0913422	61383	40	from supplier
PhytoComm	Gou Qi Zi	G150H0913621	61840	40	from supplier

Validation samples

A total of 36 840 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 *Gou Qi Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Gou Qi Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gou Qi Zi	G150H0913422	61383 [†]	20
PhytoComm	Gou Qi Zi	G150H0913621	61840 [†]	20

- 13 503 spectra from a total of 316 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.

- 12 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Gou Qi Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gou Qi Zi	G150H0913422	3
phytocomm	Gou Qi Zi	G150H0913023	1
Phytocomm	Gou Qi Zi	G150H0913121	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
PhytoComm	Gou Qi Zi	G150H0913023	2
PhytoComm	Gou Qi Zi	G150H0913121	1
PhytoComm	Gou Qi Zi	G150H0913123	1
PhytoComm	Gou Qi Zi	G150H0913221	1
PhytoComm	Gou Qi Zi	G150H0913221	2

- 1969 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	79	1	21 235
Type B	1	33	7	13 502
Type C	13	3	9	1956

The substance/substance group *Gou Qi Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9876 % (> 99.9680 %)	98.7500 % (> 95.0000 %)
Type B	99.9918 % (> 99.9566 %)	82.5000 % (> 75.0000 %)
Type C	99.4434 % (> 99.1639 %)	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
61383	61383	0.00	8.29
61840	61840	0.00	4.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gou Teng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60097-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gou Teng; Uncariae ramulus cum uncis

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gou Teng	G247H1210621	61798	40	from supplier
PhytoComm	Gou Teng	G247H1210621	61811	40	from supplier

Validation samples

A total of 36 840 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 *Gou Teng*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Gou Teng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gou Teng	G247H1210621	61798 [†]	20
PhytoComm	Gou Teng	G247H1210621	61811 [†]	20

- 13 503 spectra from a total of 317 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.

- 9 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Gou Teng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gou Teng	G247H1210422	2
Phytocomm	Gou Teng	612gt	1
PhytoComm	Gou Teng	G247H1210122	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
Phytocomm	Gou Teng	G247H1210122	3
Phytocomm	Gou Teng	g247h1210122	1
Phytocomm	Gou Teng	H1210021	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gou Teng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gou Teng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	9	1970

The substance/substance group *Gou Teng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9502 % (> 99.6709 %)	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
61798	61798	0.00	18.88
61811	61811	0.00	18.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gu Sui Bu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60225-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gu Sui Bu; Drynariae rhizoma

Special notes

When selecting the *Gu Sui Bu* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gu Sui Bu	G094H1011422	61350	40	from supplier
PhytoComm	Gu Sui Bu	G094H1011522	61714	40	from supplier

Validation samples

A total of 36 840 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 *Gu Sui Bu*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Gu Sui Bu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gu Sui Bu	G094H1011422	61350 [†]	20
PhytoComm	Gu Sui Bu	G094H1011522	61714 [†]	20

- 13 503 spectra from a total of 316 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.

- 8 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Gu Sui Bu*.

Supplier	Substance	Batch	Spectra
PhytoComm	Gu Sui Bu	G094H1011023	2
PhytoComm	Gu Sui Bu	(G094)H1011221	1
Phytocomm	Gu Sui Bu	G094H1011023	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
Phytocomm	Gu Sui Bu	g094h1011023	1
Phytocomm	Gu Sui Bu	G094H1011221	2
Phytocomm	Gu Sui Bu	g094h1011221	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gu Sui Bu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gu Sui Bu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	13	0	8	1960

The substance/substance group *Gu Sui Bu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.4942 % (> 99.2149 %)	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
61350	61350	0.00	7.87
61714	61714	0.00	20.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gua Lou**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60128-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gua Lou; Trichosanthis fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gua Lou	G241H1096521	61379	40	from supplier
PhytoComm	Gua Lou	G241H1096523	61787	40	from supplier
PhytoComm	Gua Lou	G241H1096523	61801	40	from supplier
PhytoComm	Gua Lou	G241H1096523	61877	40	from supplier
PhytoComm	Gua Lou	G241H1096523	61878	29	from supplier
PhytoComm	Gua Lou	G241H1096621	61913	40	from supplier
PhytoComm	Gua Lou	G241H1096621	61914	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 269 spectra of 7 reference samples from the substance/substance group *Gua Lou*. These samples are listed above in the [calibration samples](#) section.
- 21 047 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 139 spectra of 7 reference samples from the substance/substance group *Gua Lou*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gua Lou	G241H1096521	61379 [†]	20
PhytoComm	Gua Lou	G241H1096523	61787 [†]	20
PhytoComm	Gua Lou	G241H1096523	61801 [†]	20
PhytoComm	Gua Lou	G241H1096523	61877 [†]	19
PhytoComm	Gua Lou	G241H1096523	61878 [†]	20
PhytoComm	Gua Lou	G241H1096621	61913 [†]	20
PhytoComm	Gua Lou	G241H1096621	61914 [†]	20

- 13 404 spectra from a total of 315 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.

- 11 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Gua Lou*.

[†]These spectra were recorded from 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
Phytocomm	Gua Lou	G241H1096521	1
PhytoComm	Gua Lou	G241H1096121	2
phytocomm	Gua Lou	G241H1096121	1
Phytocomm	Gua Lou	G241H1096121	1
Phytocomm	Gua Lou	G241H1096321	1
PhytoComm	Gua Lou	G241H1096321	1
Phytocomm	Gua Lou	g241h1096321	1
PhytoComm	Gua Lou	G241H1096322	2
Phytocomm	Gua Lou	H1096922	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	269	0	21 047
Type B	1	139	0	13 403
Type C	2	3	8	1968

The substance/substance group *Gua Lou* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.7695 %)
Type B	99.9754 % (> 99.9401 %)	100.0000 % (> 95.6835 %)
Type C	99.9485 % (> 99.6690 %)	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
61379	61379	0.00	13.96
61787	61787	0.00	12.27
61801	61801	0.00	12.32
61877	61877	0.00	11.39
61878	61878	0.00	11.64
61913	61913	0.00	8.69
61914	61914	0.00	8.38

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gua Lou Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60052-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gua Lou Ren; Trichosanthis semen

Special notes

When selecting the *Gua Lou Ren* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gua Lou Ren	G243H1095621	61775	40	from supplier
PhytoComm	Gua Lou Ren	G243H1095621	61809	40	from supplier

Validation samples

A total of 36 840 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 *Gua Lou Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Gua Lou Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gua Lou Ren	G243H1095621	61775 [†]	20
PhytoComm	Gua Lou Ren	G243H1095621	61809 [†]	20

- 13 503 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Gua Lou Ren*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gua Lou Ren	g243h1095123	1
Phytocomm	Gua Lou Ren	G243H1095123	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*.

- 1979 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gua Lou Ren* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gua Lou Ren* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	2	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61775	61775	0.00	13.21
61809	61809	0.00	13.18

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Guang Huo Xiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 61079-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Guang Huo Xiang; Pogostemonis herba

Special notes

When selecting the *Guang Huo Xiang* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Guang Huo Xiang	G007H2005621	62037	40	from supplier
PhytoComm	Guang Huo Xiang	G007H2005621	62038	40	from supplier

Validation samples

A total of 36 840 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 *Guang Huo Xiang*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Guang Huo Xiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Guang Huo Xiang	G007H2005621	62037 [†]	20
PhytoComm	Guang Huo Xiang	G007H2005621	62038 [†]	20

- 13 503 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 1 batches from the substance/substance group *Guang Huo Xiang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Guang Huo Xiang	G007H2005521	2

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

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Guang Huo Xiang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Guang Huo Xiang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	2	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
62037	62037	0.00	20.79
62038	62038	0.00	21.05

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gui Ban Jiao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60126-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gui Ban Jiao; Colla carapax et plastrum chrysemys

Special notes

When selecting the *Gui Ban Jiao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gui Ban Jiao	G326HS3300V1	61725	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Gui Ban Jiao*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Gui Ban Jiao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gui Ban Jiao	G326HS3300V1	61725 [†]	20

- 13 523 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Gui Ban Jiao*.

Supplier	Substance	Batch	Spectra
PhytoComm	Gui Ban Jiao	G326H2205221	1

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Gui Ban Jiao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gui Ban Jiao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	1	1980

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4487 %)	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
61725	61725	0.00	21.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Gui Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60189-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gui Zhi; Cinnamomi cassiae ramulus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gui Zhi	G070H1001422	61057	40	from supplier
PhytoComm	Gui Zhi	G070H1001422	61570	40	from supplier
PhytoComm	Gui Zhi	G070H1001523	61698	40	from supplier
PhytoComm	Gui Zhi	G070H1001621	61777	40	from supplier
PhytoComm	Gui Zhi	G070H1001621	61815	40	from supplier
PhytoComm	Gui Zhi	G070H1001621	61873	40	from supplier
PhytoComm	Gui Zhi	G070H1001621	61874	40	from supplier
PhytoComm	Gui Zhi	G070H1001621	62065	40	from supplier

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Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Gui Zhi	G070H1001621	62066	40	from supplier
PhytoComm	Gui Zhi	G070H1001624	62103	40	from supplier
PhytoComm	Gui Zhi	G070H1001624	62104	40	from supplier

Validation samples

A total of 36 840 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 *Gui Zhi*. These samples are listed above in the [calibration samples](#) section.
- 20 876 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 275 spectra of 11 reference samples from the substance/substance group *Gui Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Gui Zhi	G070H1001422	61057 [†]	20
PhytoComm	Gui Zhi	G070H1001422	61279	75
PhytoComm	Gui Zhi	G070H1001523	61698 [†]	20
PhytoComm	Gui Zhi	G070H1001621	61777 [†]	20
PhytoComm	Gui Zhi	G070H1001621	61815 [†]	20
PhytoComm	Gui Zhi	G070H1001621	61873 [†]	20
PhytoComm	Gui Zhi	G070H1001621	61874 [†]	20
PhytoComm	Gui Zhi	G070H1001621	62065 [†]	20
PhytoComm	Gui Zhi	G070H1001621	62066 [†]	20
PhytoComm	Gui Zhi	G070H1001624	62103 [†]	20
PhytoComm	Gui Zhi	G070H1001624	62104 [†]	20

- 13 268 spectra from a total of 314 batches from further 202 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

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

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

Type C Spectra 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 8 *Apo-Ident* customers from 5 batches from the substance/substance group *Gui Zhi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Gui Zhi	G070H1001523	2
PhytoComm	Gui Zhi	G070H1001221	1
Phytocomm	Gui Zhi	G070H1001221	2
Phytocomm	Gui Zhi	g070h1001422	1
Phytocomm	Gui Zhi	G070H100422	1
Phytocomm	Gui Zhi	H1001022	5
PhytoComm	Gui Zhi	H1001022	3

- 1966 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gui Zhi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gui Zhi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 876
Type B	3	273	2	13 265
Type C	9	5	10	1957

The substance/substance group *Gui Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 98.6364 %)
Type B	99.9924 % (> 99.9571 %)	99.2727 % (> 98.1818 %)
Type C	99.4337 % (> 99.1542 %)	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
61057	61057	0.00	9.66
61570	61570	0.00	10.76
61698	61698	0.00	11.02
61777	61777	0.00	8.34
61815	61815	0.00	9.88
61873	61873	0.00	9.20
61874	61874	0.00	9.19
62065	62065	0.00	12.02
62066	62066	0.00	11.72
62103	62103	0.00	9.87
62104	62104	0.00	11.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Han Lian Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60540-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Han Lian Cao; Ecliptae prostratae herba

Special notes

When selecting the *Han Lian Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Han Lian Cao	G095H0770622	62077	40	from supplier
PhytoComm	Han Lian Cao	G095H0770622	62078	40	from supplier

Validation samples

A total of 36 840 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 *Han Lian Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Han Lian Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Han Lian Cao	G095H0770622	62077 [†]	20
PhytoComm	Han Lian Cao	G095H0770622	62078 [†]	20

- 13 503 spectra from a total of 317 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.

- 12 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Han Lian Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Han Lian Cao	G095H0770321	1
Phytocomm	Han Lian Cao	g095h0770321	1
Phytocomm	Han Lian Cao	G095H0770521	4

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
PhytoComm	Han Lian Cao	G095H0770121	3
Phytocomm	Han Lian Cao	G095H0770121	1
PhytoComm	Han Lian Cao	G263H1423121	2

- 1969 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Han Lian Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Han Lian Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	12	1969

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4410 %)	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
62077	62077	0.00	10.07
62078	62078	0.00	10.32

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **He Huan Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60175-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

He Huan Pi; Albiziae cortex; Albiziae julibrissini cortex

Special notes

When selecting the *He Huan Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	He Huan Pi	G010H0635523	61795	40	from supplier
PhytoComm	He Huan Pi	G010H0635523	61816	40	from supplier
PhytoComm	He Huan Pi	G010H0635622	62101	40	from supplier
PhytoComm	He Huan Pi	G010H0635622	62102	40	from supplier

Validation samples

A total of 36 840 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 *He Huan Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 4 reference samples from the substance/substance group *He Huan Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	He Huan Pi	G010H0635523	61795 [†]	20
PhytoComm	He Huan Pi	G010H0635523	61816 [†]	20
PhytoComm	He Huan Pi	G010H0635622	62101 [†]	15
PhytoComm	He Huan Pi	G010H0635622	62102 [†]	20

- 13 468 spectra from a total of 316 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.

- 8 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *He Huan Pi*.

Supplier	Substance	Batch	Spectra
Phytocomm	He Huan Pi	G010H0635221	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
PhytoComm	He Huan Pi	G010H0635221	2
Phytocomm	He Huan Pi	g010h0635221	1
PhytoComm	He Huan Pi	G010H0635321	1
Phytocomm	He Huan Pi	G010H0635423	1
PhytoComm	He Huan Pi	H0635021	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *He Huan Pi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *He Huan Pi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	75	0	13 468
Type C	1	1	7	1972

The substance/substance group *He Huan Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.9627 % (> 99.6834 %)	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
61795	61795	0.00	11.53
61816	61816	0.00	11.90
62101	62101	0.00	9.53
62102	62102	0.00	9.22

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **He Shou Wu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60101-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

He Shou Wu; Polygoni multiflori radix

Special notes

When selecting the *He Shou Wu* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	He Shou Wu	G198H0718421	61463	40	from supplier
PhytoComm	He Shou Wu	G198H0718421	62059	40	from supplier
PhytoComm	He Shou Wu	G198H0718421	62060	40	from supplier

Validation samples

A total of 36 840 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 *He Shou Wu*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *He Shou Wu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	He Shou Wu	G198H0718421	61171	75
PhytoComm	He Shou Wu	G198H0718421	62059 [†]	20
PhytoComm	He Shou Wu	G198H0718421	62060 [†]	20

- 13 428 spectra from a total of 317 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.

- 9 spectra from 8 *Apo-Ident* customers from 5 batches from the substance/substance group *He Shou Wu*.

Supplier	Substance	Batch	Spectra
Phytocomm	He Shou Wu	G198H0718222	1
PhytoComm	He Shou Wu	(G198)H0718222	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
Phytocomm	He Shou Wu	g198h0718222	1
PhytoComm	He Shou Wu	G198H0718222	1
Phytocomm	He Shou Wu	G198H0718421	2
PhytoComm	He Shou Wu	G198H0718421	1
Phytocomm	He Shou Wu	H0718021	1
PhytoComm	He Shou Wu	H0718021	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *He Shou Wu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *He Shou Wu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	106	9	13 428
Type C	4	3	6	1968

The substance/substance group *He Shou Wu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	92.1739 % (> 89.5652 %)
Type C	99.8919 % (> 99.6125 %)	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
61463	61463	0.00	7.91
62059	62059	0.00	7.25
62060	62060	0.00	7.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **He Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60512-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

He Ye; Nelumbinis nuciferae folium

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	He Ye	G170H1170521	61646	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *He Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *He Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	He Ye	G170H1170521	61646 [†]	20

- 13 523 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *He Ye*.

Supplier	Substance	Batch	Spectra
PhytoComm	He Ye	H1170922	1

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *He Ye* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *He Ye* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	10	0	1	1970

The substance/substance group *He Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.4948 % (> 99.2192 %)	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
61646	61646	0.00	6.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Hei Zhi Ma**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 61724-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hei Zhi Ma; Sesami indicii semen; Sesami semen nigrum

Special notes

When selecting the *Hei Zhi Ma* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Hei Zhi Ma	G228H1178521	61724	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Hei Zhi Ma*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Hei Zhi Ma*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Hei Zhi Ma	G228H1178521	61724 [†]	20

- 13 523 spectra from a total of 317 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.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Hei Zhi Ma*.
- 1981 spectra from 16 *Apo-Ident* customers from a total of 964 batches from a further 268 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hei Zhi Ma* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant

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

spectra of the various substances were compared with *Hei Zhi Ma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	0	1981

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4403 %)	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
61724	61724	0.00	35.64

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Hong Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60206-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hong Hua; Carthami flos

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Hong Hua	G057H0901621	61768	40	from supplier
PhytoComm	Hong Hua	G057H0901621	61845	40	from supplier
PhytoComm	Hong Hua	G057H0901622	62093	40	from supplier
PhytoComm	Hong Hua	G057H0901622	62094	40	from supplier

Validation samples

A total of 36 840 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 *Hong Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Hong Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Hong Hua	G057H0901621	61768 [†]	20
PhytoComm	Hong Hua	G057H0901621	61845 [†]	20
PhytoComm	Hong Hua	G057H0901622	62093 [†]	20
PhytoComm	Hong Hua	G057H0901622	62094 [†]	20

- 13 463 spectra from a total of 316 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.

- 9 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Hong Hua*.

Supplier	Substance	Batch	Spectra
phythocom	Hong Hua	g057h0901121	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
Phytocomm	Hong Hua	41024032/2	1
PhytoComm	Hong Hua	G057H0901121	2
Phytocomm	Hong Hua	G057H0901121	1
Phytocomm	Hong Hua	g057h0901121	1
Phytocomm	Hong Hua	G057H0901221	1
Phytocomm	Hong Hua	G057H0901322	1
PhytoComm	Hong Hua	G057H0901221	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hong Hua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hong Hua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	9	2	7	1963

The substance/substance group *Hong Hua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.4881 % (> 99.2087 %)	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
61768	61768	0.00	9.67
61845	61845	0.00	9.98
62093	62093	0.00	10.63
62094	62094	0.00	10.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Hong Jing Tian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60031-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hong Jing Tian; Rhodiolae crenulatae radix

Special notes

When selecting the *Hong Jing Tian* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Hong Jing Tian	G237H0906421	61097	40	from supplier
PhytoComm	Hong Jing Tian	G237H0906421	61430	40	from supplier
PhytoComm	Hong Jing Tian	G237H0906621	61911	40	from supplier
PhytoComm	Hong Jing Tian	G237H0906621	61912	40	from supplier

Validation samples

A total of 36 840 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 *Hong Jing Tian*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 134 spectra of 4 reference samples from the substance/substance group *Hong Jing Tian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Hong Jing Tian	G237H0906421	61097 [†]	19
PhytoComm	Hong Jing Tian	G237H0906421	61138	75
PhytoComm	Hong Jing Tian	G237H0906621	61911 [†]	20
PhytoComm	Hong Jing Tian	G237H0906621	61912 [†]	20

- 13 409 spectra from a total of 316 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.

- 6 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Hong Jing Tian*.

Supplier	Substance	Batch	Spectra
PhytoComm	Hong Jing Tian	G237H0906221	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
Phytocomm	Hong Jing Tian	G237H0906221	2
Phytocomm	Hong Jing Tian	G237H0906321	1
Herbasinica	Hong Jing Tian	H0906021	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hong Jing Tian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hong Jing Tian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	134	0	13 409
Type C	0	1	5	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5224 %)
Type C	100.0000 % (> 99.4417 %)	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
61097	61097	0.00	13.96
61430	61430	0.00	12.97
61911	61911	0.00	15.50
61912	61912	0.00	15.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Hou Po**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50289-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hou Po; Magnoliae officinalis cortex

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Hou Po	G154H0917423	61387	40	from supplier
PhytoComm	Hou Po	G154H0917421	61501	40	from supplier
PhytoComm	Hou Po	G154H0917521	61782	40	from supplier
PhytoComm	Hou Po	G154H0917521	61826	40	from supplier

Validation samples

A total of 36 840 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 *Hou Po*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 *Hou Po*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Hou Po	G154H0917421	61209	100
PhytoComm	Hou Po	G154H0917423	61387 [†]	20
PhytoComm	Hou Po	G154H0917521	61782 [†]	20
PhytoComm	Hou Po	G154H0917521	61826 [†]	20

- 13 383 spectra from a total of 315 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.

- 6 spectra from 5 *Apo-Ident* customers from 2 batches from the substance/substance group *Hou Po*.

Supplier	Substance	Batch	Spectra
PhytoComm	Hou Po	G154H0917222	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
Phytocomm	Hou Po	G154H0917222	1
phytocomm	Hou Po	H0917022	1
PhytoComm	Hou Po	H0917022	1
Phytocomm	Hou Po	H0917022	2

- 1975 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hou Po* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hou Po* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	160	0	13 383
Type C	10	2	4	1965

The substance/substance group *Hou Po* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.2500 %)
Type C	99.5854 % (> 99.3063 %)	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
61387	61387	0.00	14.99
61501	61501	0.00	14.35
61782	61782	0.00	10.15
61826	61826	0.00	9.11

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huai Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60120-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huai Hua; Sophorae japonicae flos

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huai Hua	G263H1423521	61891	40	from supplier
PhytoComm	Huai Hua	G263H1423521	61892	40	from supplier

Validation samples

A total of 36 840 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 *Huai Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Huai Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huai Hua	G263H1423521	61891 [†]	20
PhytoComm	Huai Hua	G263H1423521	61892 [†]	20

- 13 503 spectra from a total of 317 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.

- 6 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Huai Hua*.

Supplier	Substance	Batch	Spectra
Phytocomm	Huai Hua	G263H1423421	1
Phytocomm	Huai Hua	G263H1423121	1
PhytoComm	Huai Hua	G263H1423121	2
PhytoComm	Huai Hua	G263H143121	1
phythocom	Huai Hua	g263h1423121	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*.

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Huai Hua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Huai Hua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	1	5	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4417 %)	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
61891	61891	0.00	23.16
61892	61892	0.00	22.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huang Bo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60057-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huang Bo; Phellodendri cortex chinensis

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huang Bo	G188H1203622	61953	40	from supplier
PhytoComm	Huang Bo	G188H1203622	61954	40	from supplier

Validation samples

A total of 36 840 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 *Huang Bo*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Huang Bo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huang Bo	G188H1203622	61953 [†]	20
PhytoComm	Huang Bo	G188H1203622	61954 [†]	20

- 13 503 spectra from a total of 317 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 9 *Apo-Ident* customers from 5 batches from the substance/substance group *Huang Bo*.

Supplier	Substance	Batch	Spectra
PhytoComm	Huang Bo	G188H1203123	2
Phytocomm	Huang Bo	G188H1203321	4
Phytocomm	Huang Bo	161213hb	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
Phytocomm	Huang Bo	G188H1203123	4
Phytocomm	Huang Bo	g188h1203123	1
PhytoComm	Huang Bo	G188H1203321	2
Phytocomm	Huang Bo	h1203022	1

- 1966 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Huang Bo* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Huang Bo* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	15	1966

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4409 %)	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
61953	61953	0.00	11.59
61954	61954	0.00	11.17

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huang Jing**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60108-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huang Jing; Polygonati rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huang Jing	G196H1206521	61746	40	from supplier
PhytoComm	Huang Jing	G196H1206522	61951	40	from supplier
PhytoComm	Huang Jing	G196H1206522	61952	40	from supplier

Validation samples

A total of 36 840 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 *Huang Jing*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Huang Jing*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huang Jing	G196H1206521	61746 [†]	20
PhytoComm	Huang Jing	G196H1206522	61951 [†]	20
PhytoComm	Huang Jing	G196H1206522	61952 [†]	20

- 13 483 spectra from a total of 316 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.

- 6 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Huang Jing*.

Supplier	Substance	Batch	Spectra
phytoComm	Huang Jing	FA1206822	1
ChinaMedica	Huang Jing	G196H1206121	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
Phytocomm	Huang Jing	G196H1206121	2
Phytocomm	Huang Jing	g196h1206121	1
PhytoComm	Huang Jing	G196H1206121	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Huang Jing* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Huang Jing* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	5	0	6	1970

The substance/substance group *Huang Jing* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.6212 % (> 99.3421 %)	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
61746	61746	0.00	17.76
61951	61951	0.00	8.82
61952	61952	0.00	8.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huang Lian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60219-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huang Lian; Coptidis rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huang Lian	G079H1205421	61045	40	from supplier
PhytoComm	Huang Lian	G079H1205421	61523	40	from supplier
PhytoComm	Huang Lian	G079H1205521	61729	40	from supplier
PhytoComm	Huang Lian	G079H1205621	61776	40	from supplier
PhytoComm	Huang Lian	G079H1205621	61819	40	from supplier
PhytoComm	Huang Lian	G079H1205622	62091	40	from supplier
PhytoComm	Huang Lian	G079H1205622	62092	40	from supplier

Validation samples

A total of 36 840 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 *Huang Lian*. These samples are listed above in the [calibration samples](#) section.
- 21 036 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 195 spectra of 7 reference samples from the substance/substance group *Huang Lian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huang Lian	G079H1205421	61045 [†]	20
PhytoComm	Huang Lian	G079H1205421	61232	75
PhytoComm	Huang Lian	G079H1205521	61729 [†]	20
PhytoComm	Huang Lian	G079H1205621	61776 [†]	20
PhytoComm	Huang Lian	G079H1205621	61819 [†]	20
PhytoComm	Huang Lian	G079H1205622	62091 [†]	20
PhytoComm	Huang Lian	G079H1205622	62092 [†]	20

- 13 348 spectra from a total of 314 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.

- 14 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Huang Lian*.

[†]These spectra were recorded from 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
PhytoComm	Huang Lian	FA1205702	1
Phytocomm	Huang Lian	G079H1205321	2
Phytocomm	Huang Lian	G079H1205021	1
PhytoComm	Huang Lian	G079H1205321	2
Phytocomm	Huang Lian	g079h1205321	1
Phytocomm	Huang Lian	G079H1205521	2
PhytoComm	Huang Lian	G079H1205521	2
PhytoComm	Huang Lian	H1205021	2
Phytocomm	Huang Lian	H1205021	1

- 1967 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Huang Lian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Huang Lian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 036
Type B	0	195	0	13 348
Type C	0	11	3	1967

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.9231 %)
Type C	100.0000 % (> 99.4409 %)	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
61045	61045	0.00	40.40
61523	61523	0.00	37.12
61729	61729	0.00	39.81
61776	61776	0.00	40.46
61819	61819	0.00	40.56
62091	62091	0.00	39.53
62092	62092	0.00	39.22

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huang Qi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60154-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huang Qi; Astragali membranacei radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huang Qi	G040H1202420	61595	40	from supplier
PhytoComm	Huang Qi	G040H1202621	61769	40	from supplier
PhytoComm	Huang Qi	G040H1202621	61824	40	from supplier
PhytoComm	Huang Qi	G040H1202621	62075	40	from supplier
PhytoComm	Huang Qi	G040H1202621	62076	40	from supplier

Validation samples

A total of 36 840 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 *Huang Qi*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 155 spectra of 5 reference samples from the substance/substance group *Huang Qi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huang Qi	G040H1202420	61304	75
PhytoComm	Huang Qi	G040H1202621	61769 [†]	20
PhytoComm	Huang Qi	G040H1202621	61824 [†]	20
PhytoComm	Huang Qi	G040H1202621	62075 [†]	20
PhytoComm	Huang Qi	G040H1202621	62076 [†]	20

- 13 388 spectra from a total of 316 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.

- 24 spectra from 8 *Apo-Ident* customers from 8 batches from the substance/substance group *Huang Qi*.

[†]These spectra were recorded from 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
Phytocomm	Huang Qi	G040H1202423	1
Phytocomm	Huang Qi	G040H1202521	2
PhytoComm	Huang Qi	G040H1202621	1
PhytoComm	Huang Qi	G040H1202222	3
Phytocomm	Huang Qi	G040H1202222	5
Caelo	Huang Qi	g040h1202222	1
PhytoComm	Huang Qi	G040H1202321	2
Phytocomm	Huang Qi	G040H1202321	2
Phytocomm	Huang Qi	g040h1202321	2
PhytoComm	Huang Qi	H1202021	1
Phytocomm	Huang Qi	H1202021	4

- 1957 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	200	0	21 115
Type B	0	155	0	13 388
Type C	20	2	22	1937

The substance/substance group *Huang Qi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9959 % (> 99.9763 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.1290 %)
Type C	99.2653 % (> 98.9857 %)	8.3333 % (≥ 0.0000 %)

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
61595	61595	0.00	10.80
61769	61769	0.00	6.44
61824	61824	0.00	6.00
62075	62075	0.00	5.45
62076	62076	0.00	6.05

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huang Qin**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60012-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huang Qin; Scutellariae baicalensis radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huang Qin	G225H1204322	60930	35	from supplier
PhytoComm	Huang Qin	G225H1204322	61440	40	from supplier
PhytoComm	Huang Qin	G225H1204522	61669	40	from supplier
PhytoComm	Huang Qin	G225H1204622	61919	40	from supplier
PhytoComm	Huang Qin	G225H1204622	61920	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 195 spectra of 5 reference samples from the substance/substance group *Huang Qin*. These samples are listed above in the [calibration samples](#) section.
- 21 121 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Huang Qin*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huang Qin	G225H1204322	61148	75
PhytoComm	Huang Qin	G225H1204522	61669 [†]	20
PhytoComm	Huang Qin	G225H1204622	61919 [†]	20
PhytoComm	Huang Qin	G225H1204622	61920 [†]	20

- 13 408 spectra from a total of 315 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.

- 25 spectra from 10 *Apo-Ident* customers from 8 batches from the substance/substance group *Huang Qin*.

Supplier	Substance	Batch	Spectra
PhytoComm	Huang Qin	G225H1204322	4

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
Phytocomm	Huang Qin	G225H1204522	3
Phytocomm	Huang Qin	161213hq	1
PhytoComm	Huang Qin	G225H1204022	1
Phytocomm	Huang Qin	G225H1204022	4
Phytocomm	Huang Qin	G225H1204121	3
PhytoComm	Huang Qin	G225H1204121	2
Phytocomm	Huang Qin	g225h1204121	1
Phytocomm	Huang Qin	G225H1204221	2
PhytoComm	Huang Qin	G225H1204221	2
Herbasin	Huang Qin	g225h120442	1
phytocomm	Huang Qin	G225H1204022	1

- 1956 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	195	0	21 121
Type B	0	135	0	13 408
Type C	0	18	7	1956

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.9231 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	100.0000 % (> 99.4407 %)	72.0000 % (> 60.0000 %)

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
60930	60930	0.00	20.98
61440	61440	0.00	20.40
61669	61669	0.00	25.13
61919	61919	0.00	24.86
61920	61920	0.00	25.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Huo Ma Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60234-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Huo Ma Ren; Cannabis semen; Lini semen

Special notes

When selecting the *Huo Ma Ren* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Huo Ma Ren	G141H0449321	61066	40	from supplier
PhytoComm	Huo Ma Ren	G141H0449321	61630	40	from supplier
PhytoComm	Huo Ma Ren	G141HS061	61642	40	from supplier
PhytoComm	Huo Ma Ren	G141H0449621	61846	40	from supplier
PhytoComm	Huo Ma Ren	G141H0449621	61847	40	from supplier

Validation samples

A total of 36 840 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 *Huo Ma Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 155 spectra of 5 reference samples from the substance/substance group *Huo Ma Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Huo Ma Ren	G141H0449321	61066 [†]	20
PhytoComm	Huo Ma Ren	G141H0449321	61214	75
PhytoComm	Huo Ma Ren	G141HS061	61642 [†]	20
PhytoComm	Huo Ma Ren	G141H0449621	61846 [†]	20
PhytoComm	Huo Ma Ren	G141H0449621	61847 [†]	20

- 13 388 spectra from a total of 315 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.

- 3 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Huo Ma Ren*.

[†]These spectra were recorded from 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
PhytoComm	Huo Ma Ren	G141H0449121	2
Phytocomm	Huo Ma Ren	G141HS061	1

- 1978 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	194	6	21 116
Type B	0	138	17	13 388
Type C	2	1	2	1976

The substance/substance group *Huo Ma Ren* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	97.0000 % (> 95.5000 %)
Type B	100.0000 % (> 99.9294 %)	89.0323 % (> 87.0968 %)
Type C	99.5896 % (> 99.3111 %)	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
61066	61066	0.00	3.09
61630	61630	0.00	4.87

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
61642	61642	0.00	5.50
61846	61846	0.00	10.56
61847	61847	0.00	9.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ji Li**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60110-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ji Li; Tribuli terrestris fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ji Li	G240H1410522	61917	40	from supplier
PhytoComm	Ji Li	G240H1410522	61918	40	from supplier

Validation samples

A total of 36 840 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 *Ji Li*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ji Li*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ji Li	G240H1410522	61917 [†]	20
PhytoComm	Ji Li	G240H1410522	61918 [†]	20

- 13 503 spectra from a total of 317 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.

- 4 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Ji Li*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ji Li	G240H1410221	1
Phytocomm	Ji Li	H0858021	2
Phytocomm	Ji Li	G240H1410421	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*.

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ji Li* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ji Li* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	4	0	4	1973

The substance/substance group *Ji Li* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8290 % (> 99.5502 %)	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
61917	61917	0.00	6.00
61918	61918	0.00	6.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ji Nei Jin**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50329-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ji Nei Jin; Endothelium corneum gigeriae galli

Special notes

When selecting the *Ji Nei Jin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ji Nei Jin	G259H2102421	61654	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ji Nei Jin*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ji Nei Jin*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ji Nei Jin	G259H2102421	61654 [†]	20

- 13 523 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Ji Nei Jin*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ji Nei Jin	G259H2102023	2
Phytocomm	Ji Nei Jin	G259H2102023	1
PhytoComm	Ji Nei Jin	G259H2102321	1
Phytocomm	Ji Nei Jin	G259H2102321	1
Phytocomm	Ji Nei Jin	g259h2102321	1
PhytoComm	Ji Nei Jin	H2102021	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	0	7	1973

The substance/substance group *Ji Nei Jin* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9067 % (> 99.6275 %)	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
61654	61654	0.00	13.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ji Xue Teng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60099-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ji Xue Teng; Spatholobi caulis

Special notes

When selecting the *Ji Xue Teng* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ji Xue Teng	G159H2101622	61999	40	from supplier
PhytoComm	Ji Xue Teng	G159H2101622	62000	40	from supplier

Validation samples

A total of 36 840 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 *Ji Xue Teng*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ji Xue Teng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ji Xue Teng	G159H2101622	61999 [†]	20
PhytoComm	Ji Xue Teng	G159H2101622	62000 [†]	20

- 13 503 spectra from a total of 317 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.

- 10 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Ji Xue Teng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ji Xue Teng	G159H2101423	3
Phytocomm	Ji Xue Teng	G159H2101122	2
PhytoComm	Ji Xue Teng	G159H2101122	3

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
Phytocomm	Ji Xue Teng	g159h2101122	1
Phytocomm	Ji Xue Teng	H2101923	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ji Xue Teng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ji Xue Teng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	0	10	1970

The substance/substance group *Ji Xue Teng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9585 % (> 99.6791 %)	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
61999	61999	0.00	15.96
62000	62000	0.00	15.90

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jiang Huang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60181-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jiang Huang; Curcumae longae rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jiang Huang	G085H1716422	61683	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Jiang Huang*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Jiang Huang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jiang Huang	G085H1716422	61683 [†]	20

- 13 523 spectra from a total of 317 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.

- 12 spectra from 8 *Apo-Ident* customers from 4 batches from the substance/substance group *Jiang Huang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Jiang Huang	G085H1716422	3
PhytoComm	Jiang Huang	G085H1716321	2
PhytoComm	Jiang Huang	G085H1716422	1
phytocomm	Jiang Huang	G085H1716022	1
PhytoComm	Jiang Huang	G085H1716022	1
PhytoComm	Jiang Huang	G085H1716122	2
Phytocomm	Jiang Huang	G085H1716022	1
Phytocomm	Jiang Huang	G085H1716122	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*.

- 1969 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	7	5	1969

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4410 %)	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
61683	61683	0.00	13.47

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jiao Gu Lan**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60332-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jiao Gu Lan; Gynostemma herba

Special notes

When selecting the *Jiao Gu Lan* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jiao Gu Lan	G065FB1276621	62013	40	from supplier
PhytoComm	Jiao Gu Lan	G065FB1276621	62014	40	from supplier

Validation samples

A total of 36 840 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 *Jiao Gu Lan*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Jiao Gu Lan*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jiao Gu Lan	G065FB1276621	62013 [†]	20
PhytoComm	Jiao Gu Lan	G065FB1276621	62014 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Jiao Gu Lan*.

Supplier	Substance	Batch	Spectra
Phytocomm	Jiao Gu Lan	G065FB1276421	3
Phytocomm	Jiao Gu Lan	G065F-B1276121	1
Herbasin	Jiao Gu Lan	G065FB1276121	1
Herbasinica	Jiao Gu Lan	G065F-B1276121	1
PhytoComm	Jiao Gu Lan	G065H1276922	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jiao Gu Lan* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jiao Gu Lan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	7	1972

The substance/substance group *Jiao Gu Lan* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9160 % (> 99.6368 %)	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
62013	62013	0.00	9.19
62014	62014	0.00	9.87

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jie Geng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60034-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jie Geng; Platycodi grandiflori radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jie Geng	G193H1015521	61378	40	from supplier
PhytoComm	Jie Geng	G193H1015621	61931	40	from supplier
PhytoComm	Jie Geng	G193H1015621	61932	40	from supplier

Validation samples

A total of 36 840 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 *Jie Geng*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Jie Geng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jie Geng	G193H1015521	61378 [†]	20
PhytoComm	Jie Geng	G193H1015621	61931 [†]	20
PhytoComm	Jie Geng	G193H1015621	61932 [†]	20

- 13 483 spectra from a total of 316 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 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Jie Geng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Jie Geng	G193H1015521	3
PhytoComm	Jie Geng	G193H1015024	2

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
Phytocomm	Jie Geng	G193H1015024	3
phytocomm	Jie Geng	G193H1015025	1
Phytocomm	Jie Geng	G193H1015025	2
Phytocomm	Jie Geng	G193H1015221	3
Phytocomm	Jie Geng	g193h1015221	1

- 1966 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jie Geng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jie Geng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	5	2	13	1961

The substance/substance group *Jie Geng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.8673 % (> 99.5877 %)	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
61378	61378	0.00	8.83
61931	61931	0.00	6.35
61932	61932	0.00	6.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jin Qian Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50293-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jin Qian Cao; Lysimachiae herba

Special notes

When selecting the *Jin Qian Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jin Qian Cao	G151HS368	61861	40	from supplier
PhytoComm	Jin Qian Cao	G151HS368	61862	40	from supplier

Validation samples

A total of 36 840 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 *Jin Qian Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Jin Qian Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jin Qian Cao	G151HS368	61861 [†]	20
PhytoComm	Jin Qian Cao	G151HS368	61862 [†]	20

- 13 503 spectra from a total of 317 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.

- 10 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Jin Qian Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Jin Qian Cao	G1514H0847122	1
PhytoComm	Jin Qian Cao	G151H0847122	1
Phytocomm	Jin Qian Cao	G151H0847122	2

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
Phytocomm	Jin Qian Cao	g151h0847122	1
PhytoComm	Jin Qian Cao	G151H0847922	2
Phytocomm	Jin Qian Cao	G151H0847922	1
PhytoComm	Jin Qian Cao	H0847921	1
Phytocomm	Jin Qian Cao	H0847921	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jin Qian Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jin Qian Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	10	1971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4412 %)	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
61861	61861	0.00	50.36
61862	61862	0.00	50.04

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jin Yin Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60350-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jin Yin Hua; Lonicerae japonicae flos

Special notes

When selecting the *Jin Yin Hua* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jin Yin Hua	G145H0845621	61778	40	from supplier
PhytoComm	Jin Yin Hua	G145H0845621	61822	40	from supplier
PhytoComm	Jin Yin Hua	G145H0845621	61871	40	from supplier
PhytoComm	Jin Yin Hua	G145H0845621	61872	40	from supplier

Validation samples

A total of 36 840 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 *Jin Yin Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Jin Yin Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jin Yin Hua	G145H0845621	61778 [†]	20
PhytoComm	Jin Yin Hua	G145H0845621	61822 [†]	20
PhytoComm	Jin Yin Hua	G145H0845621	61871 [†]	20
PhytoComm	Jin Yin Hua	G145H0845621	61872 [†]	20

- 13 463 spectra from a total of 317 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.

- 6 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Jin Yin Hua*.

Supplier	Substance	Batch	Spectra
Phytocomm	Jin Yin Hua	G145H0845021	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
Phytocomm	Jin Yin Hua	G145H0845022	4
Phytocomm	Jin Yin Hua	G145H0845321	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jin Yin Hua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jin Yin Hua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	17	0	6	1958

The substance/substance group *Jin Yin Hua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.2682 % (> 98.9891 %)	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
61778	61778	0.00	9.09
61822	61822	0.00	8.57
61871	61871	0.00	10.26
61872	61872	0.00	9.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jing Jie**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60088-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jing Jie; Schizonepetae tenuifoliae herba

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jing Jie	G221HS218	61857	40	from supplier
PhytoComm	Jing Jie	G221HS218	61858	40	from supplier
PhytoComm	Jing Jie	G221H1038621	61923	40	from supplier
PhytoComm	Jing Jie	G221H1038621	61924	40	from supplier
PhytoComm	Jing Jie	G221H1038621	62055	40	from supplier
PhytoComm	Jing Jie	G221H1038621	62056	40	from supplier

Validation samples

A total of 36 840 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 *Jing Jie*. These samples are listed above in the [calibration samples](#) section.
- 21 076 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 6 reference samples from the substance/substance group *Jing Jie*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jing Jie	G221HS218	61857 [†]	20
PhytoComm	Jing Jie	G221HS218	61858 [†]	20
PhytoComm	Jing Jie	G221H1038621	61923 [†]	20
PhytoComm	Jing Jie	G221H1038621	61924 [†]	20
PhytoComm	Jing Jie	G221H1038621	62055 [†]	20
PhytoComm	Jing Jie	G221H1038621	62056 [†]	20

- 13 423 spectra from a total of 316 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.

- 11 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Jing Jie*.

[†]These spectra were recorded from 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
Sino Phyto	Jing Jie	G221H1038121	1
phytocomm	Jing Jie	G221H1038121	2
PhytoComm	Jing Jie	G221H1038121	1
Phytocomm	Jing Jie	G221H1038221	4
Phytocomm	Jing Jie	g221h1038221	1
PhytoComm	Jing Jie	G221H1038221	1
PhytoComm	Jing Jie	H1038021	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jing Jie* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jing Jie* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 076
Type B	0	120	0	13 423
Type C	4	4	7	1966

The substance/substance group *Jing Jie* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.0000 %)
Type C	99.7886 % (> 99.5091 %)	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
61857	61857	0.00	6.81
61858	61858	0.00	6.90
61923	61923	0.00	5.96
61924	61924	0.00	5.63
62055	62055	0.00	5.63
62056	62056	0.00	5.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ju Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60232-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ju Hua; Chrysanthemi flos

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ju Hua	G064H1231301	60988	40	from supplier
PhytoComm	Ju Hua	G064H1231321	61572	40	from supplier
PhytoComm	Ju Hua	G064H1231421	61697	40	from supplier
PhytoComm	Ju Hua	G064H1231521	62023	40	from supplier
PhytoComm	Ju Hua	G064H1231521	62024	40	from supplier

Validation samples

A total of 36 840 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 *Ju Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Ju Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ju Hua	G064H1231321	61281	75
PhytoComm	Ju Hua	G064H1231421	61697 [†]	20
PhytoComm	Ju Hua	G064H1231521	62023 [†]	20
PhytoComm	Ju Hua	G064H1231521	62024 [†]	20

- 13 408 spectra from a total of 315 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.

- 5 spectra from 5 *Apo-Ident* customers from 2 batches from the substance/substance group *Ju Hua*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ju Hua	G064H1231421	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
PhytoComm	Ju Hua	G064H1231421	1
PhytoComm	Ju Hua	G064H1231021	2

- 1976 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ju Hua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ju Hua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	135	0	13 408
Type C	16	5	0	1960

The substance/substance group *Ju Hua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	99.1529 % (> 98.8740 %)	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
60988	60988	0.00	12.14

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
61572	61572	0.00	12.00
61697	61697	0.00	11.90
62023	62023	0.00	16.14
62024	62024	0.00	16.08

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Jue Ming Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60312-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Jue Ming Zi; Cassiae torae semen

Special notes

When selecting the *Jue Ming Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Jue Ming Zi	G059H1097521	61867	40	from supplier
PhytoComm	Jue Ming Zi	G059H1097521	61868	40	from supplier
PhytoComm	Jue Ming Zi	G059H1097521	61875	40	from supplier
PhytoComm	Jue Ming Zi	G059H1097521	61876	40	from supplier
PhytoComm	Jue Ming Zi	G059H1097621	62033	40	from supplier
PhytoComm	Jue Ming Zi	G059H1097621	62034	40	from supplier

Validation samples

A total of 36 840 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 *Jue Ming Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 076 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 6 reference samples from the substance/substance group *Jue Ming Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Jue Ming Zi	G059H1097521	61867 [†]	20
PhytoComm	Jue Ming Zi	G059H1097521	61868 [†]	20
PhytoComm	Jue Ming Zi	G059H1097521	61875 [†]	20
PhytoComm	Jue Ming Zi	G059H1097521	61876 [†]	15
PhytoComm	Jue Ming Zi	G059H1097621	62033 [†]	20
PhytoComm	Jue Ming Zi	G059H1097621	62034 [†]	20

- 13 428 spectra from a total of 316 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.

- 6 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Jue Ming Zi*.

[†]These spectra were recorded from 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
Phytocomm	Jue Ming Zi	G059H1097023	1
Phytocomm	Jue Ming Zi	G059H1097221	1
phytocomm	Jue Ming Zi	G059H1097121	1
PhytoComm	Jue Ming Zi	G059H1097221	2
PhytoComm	Jue Ming Zi	G059H1097121	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Jue Ming Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Jue Ming Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 076
Type B	0	115	0	13 428
Type C	0	2	4	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.4417 %)	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
61867	61867	0.00	16.67
61868	61868	0.00	16.40
61875	61875	0.00	15.33
61876	61876	0.00	14.85
62033	62033	0.00	8.12
62034	62034	0.00	8.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ku Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60112-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ku Shen; Sophorae flavescentis radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ku Shen	G233H0908521	61927	40	from supplier
PhytoComm	Ku Shen	G233H0908521	61928	40	from supplier

Validation samples

A total of 36 840 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 *Ku Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ku Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ku Shen	G233H0908521	61927 [†]	20
PhytoComm	Ku Shen	G233H0908521	61928 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Ku Shen*.

Supplier	Substance	Batch	Spectra
china medica 14.06.2013	Ku Shen	210013	1
Phytocomm	Ku Shen	FA0908901	1
PhytoComm	Ku Shen	G233H0908121	1
Phytocomm	Ku Shen	G233H0908121	4
Phytocomm	Ku Shen	h0908121	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*.

- 1973 spectra from 15 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ku Shen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ku Shen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	8	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4414 %)	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
61927	61927	0.00	22.32
61928	61928	0.00	22.66

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Kuan Dong Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60035-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Kuan Dong Hua; Farfarae flos; Tussilaginis farfarae flos

Special notes

When selecting the *Kuan Dong Hua* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Kuan Dong Hua	G276H1219421	61073	40	from supplier
PhytoComm	Kuan Dong Hua	G276H1219521	61660	40	from supplier

Validation samples

A total of 36 840 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 *Kuan Dong Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Kuan Dong Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Kuan Dong Hua	G276H1219421	61073 [†]	20
PhytoComm	Kuan Dong Hua	G276H1219521	61660 [†]	20

- 13 503 spectra from a total of 316 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.

- 2 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Kuan Dong Hua*.

Supplier	Substance	Batch	Spectra
PhytoComm	Kuan Dong Hua	H1219921	2

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

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Kuan Dong Hua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Kuan Dong Hua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	7	0	2	1972

The substance/substance group *Kuan Dong Hua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.7379 % (> 99.4602 %)	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
61073	61073	0.00	10.46
61660	61660	0.00	9.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lai Fu Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60067-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lai Fu Zi; Raphani sativi semen

Special notes

When selecting the *Lai Fu Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lai Fu Zi	G209H1220621	61959	40	from supplier
PhytoComm	Lai Fu Zi	G209H1220621	61960	40	from supplier

Validation samples

A total of 36 840 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 *Lai Fu Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Lai Fu Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lai Fu Zi	G209H1220621	61959 [†]	20
PhytoComm	Lai Fu Zi	G209H1220621	61960 [†]	20

- 13 503 spectra from a total of 317 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.

- 9 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Lai Fu Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Lai Fu Zi	G209H1220022	2
PhytoComm	Lai Fu Zi	G209H1220022	1
Phytocomm	Lai Fu Zi	G209H1220221	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
PhytoComm	Lai Fu Zi	G209H1220321	1
PhytoComm	Lai Fu Zi	G209H1220321	1
Herbasin	Lai Fu Zi	g209h1220321	1
PhytoComm	Lai Fu Zi	H1220922	2

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lai Fu Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lai Fu Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	9	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4413 %)	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
61959	61959	0.00	26.96
61960	61960	0.00	26.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lian Qiao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60146-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lian Qiao; Forsythiae fructus; Forsythiae suspensae fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lian Qiao	G105H1132621	61979	40	from supplier
PhytoComm	Lian Qiao	G105H1132621	61980	40	from supplier

Validation samples

A total of 36 840 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 *Lian Qiao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Lian Qiao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lian Qiao	G105H1132621	61979 [†]	20
PhytoComm	Lian Qiao	G105H1132621	61980 [†]	20

- 13 503 spectra from a total of 317 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.

- 6 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Lian Qiao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Lian Qiao	G105H1132521	1
Phytocomm	Lian Qiao	G105H1132221	2
PhytoComm	Lian Qiao	G105H1132221	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
Phytocomm	Lian Qiao	H1132022	1
PhytoComm	Lian Qiao	H1132022	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lian Qiao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lian Qiao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	6	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4417 %)	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
61979	61979	0.00	17.94
61980	61980	0.00	18.17

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lian Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60248-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lian Zi; Nelumbinis semen

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lian Zi	G171H1501421	61480	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Lian Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Lian Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lian Zi	G171H1501421	61188	75

- 13 468 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Lian Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Lian Zi	411502701	1

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	75	0	13 468
Type C	0	0	1	1980

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	100.0000 % (> 99.4487 %)	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
61480	61480	0.00	23.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ling Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60187-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ling Zhi; Ganoderma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ling Zhi	G109FB2405621	62005	40	from supplier
PhytoComm	Ling Zhi	G109FB2405621	62006	40	from supplier

Validation samples

A total of 36 840 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 *Ling Zhi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Ling Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ling Zhi	G109FB2405621	62005 [†]	20
PhytoComm	Ling Zhi	G109FB2405621	62006 [†]	20

- 13 503 spectra from a total of 317 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.

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

Supplier	Substance	Batch	Spectra
PhytoComm	Ling Zhi	G109F-B2405221	2
PhytoComm	Ling Zhi	FA2405901	1
PhytoComm	Ling Zhi	G109FB2405321	1
Phytocomm	Ling Zhi	g109fb2405321	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ling Zhi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ling Zhi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	5	1974

The substance/substance group *Ling Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9254 % (> 99.6464 %)	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
62005	62005	0.00	8.53
62006	62006	0.00	8.62

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Long Dan (Cao)**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60227-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Long Dan (Cao); Gentianae longdancao radix; Gentianae scabrae radix

Special notes

When selecting the *Long Dan (Cao)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Long Dan (Cao)	G112H1705321	60907	40	from supplier
PhytoComm	Long Dan (Cao)	G112H1705321	61527	40	from supplier

Validation samples

A total of 36 840 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 *Long Dan (Cao)*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Long Dan (Cao)*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Long Dan (Cao)	G112H1705321	61236	75

- 13 468 spectra from a total of 317 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.

- 8 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Long Dan (Cao)*.

Supplier	Substance	Batch	Spectra
Phytocomm	Long Dan (Cao)	g112h1705022	1
Phytocomm	Long Dan (Cao)	G112H1705321	3
PhytoComm	Long Dan (Cao)	G112H1705022	3
Phytocomm	Long Dan (Cao)	G112H1705022	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	80	0	21 235
Type B	0	75	0	13 468
Type C	19	4	4	1954

The substance/substance group *Long Dan (Cao)* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9876 % (> 99.9680 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.3432 % (> 99.0639 %)	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
60907	60907	0.00	10.91
61527	61527	0.00	6.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Long Yan Rou**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60463-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Long Yan Rou; Euphoriae longanae arillus

Special notes

When selecting the *Long Yan Rou* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Long Yan Rou	G144H1708421	61508	40	from supplier
PhytoComm	Long Yan Rou	G144H1708421	61853	40	from supplier
PhytoComm	Long Yan Rou	G144H1708421	61854	40	from supplier

Validation samples

A total of 36 840 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 *Long Yan Rou*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Long Yan Rou*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Long Yan Rou	G144H1708421	61217	75
PhytoComm	Long Yan Rou	G144H1708421	61853 [†]	20
PhytoComm	Long Yan Rou	G144H1708421	61854 [†]	20

- 13 428 spectra from a total of 317 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.

- 6 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Long Yan Rou*.

Supplier	Substance	Batch	Spectra
phytocomm	Long Yan Rou	H1708922	2
Phytocomm	Long Yan Rou	G144H1708221	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
PhytoComm	Long Yan Rou	H1708922	2
PhytoComm	Long Yan Rou	G144H1708221	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Long Yan Rou* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Long Yan Rou* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	14	2	4	1961

The substance/substance group *Long Yan Rou* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	99.1378 % (> 98.8587 %)	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
61508	61508	0.00	6.80
61853	61853	0.00	7.39
61854	61854	0.00	7.61

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lu Gen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60259-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lu Gen; Phragmitis communis rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lu Gen	G189H2014521	61663	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Lu Gen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Lu Gen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lu Gen	G189H2014521	61663 [†]	20

- 13 523 spectra from a total of 317 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.

- 10 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Lu Gen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Lu Gen	G189H2014521	1
PhytoComm	Lu Gen	G189H2014521	2
Phytocomm	Lu Gen	F100708	2
PhytoComm	Lu Gen	G189H2014221	1
Phytocomm	Lu Gen	G189H2014221	3
PhytoComm	Lu Gen	F100708	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*.

- 1971 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	3	7	1971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4412 %)	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
61663	61663	0.00	12.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lu Jiao Shuang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50328-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lu Jiao Shuang; Cervi corni degelatinatum

Special notes

When selecting the *Lu Jiao Shuang* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lu Jiao Shuang	G062H1415522	61678	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Lu Jiao Shuang*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Lu Jiao Shuang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lu Jiao Shuang	G062H1415522	61678 [†]	20

- 13 523 spectra from a total of 317 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.

- 4 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Lu Jiao Shuang*.

Supplier	Substance	Batch	Spectra
phythocom	Lu Jiao Shuang	G062H1419321	1
Phytocomm	Lu Jiao Shuang	FB1419901	2
Phytocomm	Lu Jiao Shuang	G062H1419421	1

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 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 *Lu Jiao Shuang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lu Jiao Shuang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	4	1977

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4424 %)	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
61678	61678	0.00	162.02

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Lu Lu Tong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60240-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lu Lu Tong; Liquidambaris fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Lu Lu Tong	G142H1336622	62001	40	from supplier
PhytoComm	Lu Lu Tong	G142H1336622	62002	40	from supplier

Validation samples

A total of 36 840 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 *Lu Lu Tong*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Lu Lu Tong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Lu Lu Tong	G142H1336622	62001 [†]	20
PhytoComm	Lu Lu Tong	G142H1336622	62002 [†]	20

- 13 503 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Lu Lu Tong*.

Supplier	Substance	Batch	Spectra
PhytoComm	Lu Lu Tong	G142GH1336022	1
PhytoComm	Lu Lu Tong	G142H1336122	1
Herbasinica	Lu Lu Tong	G142H1336122	2

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
PhytoComm	Lu Lu Tong	g142h1336122	1
PhytoComm	Lu Lu Tong	G142H1336122	1
PhytoComm	Lu Lu Tong	G142H1336321	1
PhytoComm	Lu Lu Tong	G142H1336521	2

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lu Lu Tong* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lu Lu Tong* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	1	8	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4413 %)	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
62001	62001	0.00	17.69
62002	62002	0.00	17.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ma Bian Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60479-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ma Bian Cao; Verbenae officinalis herba

Special notes

When selecting the *Ma Bian Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ma Bian Cao	G248H1085621	61833	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ma Bian Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ma Bian Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ma Bian Cao	G248H1085621	61833 [†]	20

- 13 523 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Ma Bian Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ma Bian Cao	G248H1085221	1

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Ma Bian Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ma Bian Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	1	1980

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4487 %)	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
61833	61833	0.00	7.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ma Huang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50283-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ma Huang; Ephedrae herba

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ma Huang	G097H1101422	61542	40	from supplier
PhytoComm	Ma Huang	G097H1101522	61684	40	from supplier
PhytoComm	Ma Huang	G097H1101422	61692	40	from supplier

Validation samples

A total of 36 840 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 *Ma Huang*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Ma Huang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ma Huang	G097H1101422	61251	75
PhytoComm	Ma Huang	G097H1101522	61684 [†]	20
PhytoComm	Ma Huang	G097H1101422	61692 [†]	20

- 13 428 spectra from a total of 316 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.

- 8 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Ma Huang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ma Huang	G097H1101522	2
Phytocomm	Ma Huang	G097H1101223	3

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

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Supplier	Substance	Batch	Spectra
PhytoComm	Ma Huang	H1101023	2
Phytocomm	Ma Huang	H1101023	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ma Huang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ma Huang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	0	5	3	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.4414 %)	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
61542	61542	0.00	51.45
61684	61684	0.00	36.76
61692	61692	0.00	49.98

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ma Huang Gen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60063-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ma Huang Gen; Ephedrae radix

Special notes

When selecting the *Ma Huang Gen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ma Huang Gen	G278HS3930V1	61727	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ma Huang Gen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ma Huang Gen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ma Huang Gen	G278HS3930V1	61727 [†]	20

- 13 523 spectra from a total of 317 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.

- 10 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Ma Huang Gen*.

Supplier	Substance	Batch	Spectra
phythocom	Ma Huang Gen	g278h1102121	1
phytocomm	Ma Huang Gen	h1102021	1
PhytoComm	Ma Huang Gen	G278H1102121	1
Herbasin	Ma Huang Gen	G278H1102121	2
Phytocomm	Ma Huang Gen	G278H1102121	2
Herbasin	Ma Huang Gen	H1102021	1
Phytocomm	Ma Huang Gen	H1102021	1
PhytoComm	Ma Huang Gen	H1102021	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*.

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	6	40	0	21 270
Type B	18	20	0	13 505
Type C	0	0	10	1971

The substance/substance group *Ma Huang Gen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9851 % (> 99.9656 %)	100.0000 % (> 85.0000 %)
Type B	99.9378 % (> 99.9028 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4412 %)	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
61727	61727	0.00	2.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mai Men Dong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60024-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mai Men Dong; Ophiopogonis radix

Special notes

When selecting the *Mai Men Dong* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mai Men Dong	G176H1118521	61364	40	from supplier
PhytoComm	Mai Men Dong	G176H1118521	61694	40	from supplier
PhytoComm	Mai Men Dong	G176H1118621	61945	40	from supplier
PhytoComm	Mai Men Dong	G176H1118621	61946	40	from supplier

Validation samples

A total of 36 840 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 *Mai Men Dong*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Mai Men Dong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mai Men Dong	G176H1118521	61364 [†]	20
PhytoComm	Mai Men Dong	G176H1118521	61694 [†]	20
PhytoComm	Mai Men Dong	G176H1118621	61945 [†]	20
PhytoComm	Mai Men Dong	G176H1118621	61946 [†]	20

- 13 463 spectra from a total of 316 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.

- 11 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Mai Men Dong*.

Supplier	Substance	Batch	Spectra
PhytoComm	Mai Men Dong	G176H1118322	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
Phytocomm	Mai Men Dong	G176H1118521	3
Phytocomm	Mai Men Dong	1206mmd	1
Phytocomm	Mai Men Dong	G176H1118221	1
Phytocomm	Mai Men Dong	g176h1118221	1
Phytocomm	Mai Men Dong	H1118021	2
PhytoComm	Mai Men Dong	H1118021	2

- 1970 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mai Men Dong* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mai Men Dong* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	1	4	7	1969

The substance/substance group *Mai Men Dong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.9585 % (> 99.6791 %)	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
61364	61364	0.00	13.03
61694	61694	0.00	11.85
61945	61945	0.00	15.44
61946	61946	0.00	15.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mai Ya**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60210-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mai Ya; Hordei vulgaris fructus germinatus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mai Ya	G123H1119421	61520	40	from supplier
PhytoComm	Mai Ya	G123H1119521	61745	40	from supplier
PhytoComm	Mai Ya	G123H1119521	62069	40	from supplier
PhytoComm	Mai Ya	G123H1119521	62070	31	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 151 spectra of 4 reference samples from the substance/substance group *Mai Ya*. These samples are listed above in the [calibration samples](#) section.
- 21 165 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Mai Ya*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mai Ya	G123H1119421	61229	75
PhytoComm	Mai Ya	G123H1119521	61745 [†]	20
PhytoComm	Mai Ya	G123H1119521	62069 [†]	20
PhytoComm	Mai Ya	G123H1119521	62070 [†]	20

- 13 408 spectra from a total of 316 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.

- 8 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Mai Ya*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mai Ya	G123H1119521	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
Phytocomm	Mai Ya	G123H1119022	1
Phytocomm	Mai Ya	g123h1119022	1
PhytoComm	Mai Ya	G123H1119022	1
PhytoComm	Mai Ya	G123H1119122	2
Phytocomm	Mai Ya	G123H1119122	1
PhytoComm	Mai Ya	H1119922	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	151	0	21 165
Type B	2	134	1	13 406
Type C	7	1	7	1966

The substance/substance group *Mai Ya* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.0265 %)
Type B	99.9836 % (> 99.9483 %)	99.2593 % (> 97.0370 %)
Type C	99.6467 % (> 99.3674 %)	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
61520	61520	0.00	9.66
61745	61745	0.00	5.93
62069	62069	0.00	7.57
62070	62070	0.00	7.40

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Man Jing Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60025-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Man Jing Zi; Vitis fructus

Special notes

When selecting the *Man Jing Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Man Jing Zi	G250H1505522	61739	40	from supplier
PhytoComm	Man Jing Zi	G250H1505622	61899	40	from supplier
PhytoComm	Man Jing Zi	G250H1505622	61900	40	from supplier

Validation samples

A total of 36 840 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 *Man Jing Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Man Jing Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Man Jing Zi	G250H1505522	61739 [†]	20
PhytoComm	Man Jing Zi	G250H1505622	61899 [†]	20
PhytoComm	Man Jing Zi	G250H1505622	61900 [†]	20

- 13 483 spectra from a total of 316 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.

- 5 spectra from 3 *Apo-Ident* customers from 5 batches from the substance/substance group *Man Jing Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Man Jing Zi	h1505021	1
Phytocomm	Man Jing Zi	G250H1505121	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
Phytocomm	Man Jing Zi	H1505922	1
Phytocomm	Man Jing Zi	G250H1505122	1
PhytoComm	Man Jing Zi	H150922	1

- 1976 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Man Jing Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Man Jing Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
61739	61739	0.00	69.35
61899	61899	0.00	60.89
61900	61900	0.00	60.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mi Huan Jun**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60556-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mi Huan Jun; Armillariella mellea rhizoma

Special notes

When selecting the *Mi Huan Jun* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mi Huan Jun	G510H0418422	61067	40	from supplier
PhytoComm	Mi Huan Jun	G510H0418422	61393	40	from supplier

Validation samples

A total of 36 840 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 *Mi Huan Jun*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 *Mi Huan Jun*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mi Huan Jun	G510H0418422	61067 [†]	20
PhytoComm	Mi Huan Jun	G510H0418422	61101	60

- 13 463 spectra from a total of 317 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.

- 4 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Mi Huan Jun*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mi Huan Jun	G510H0418221	1
Phytocomm	Mi Huan Jun	G510H0418422	1
Phytocomm	Mi Huan Jun	G510H110164	2

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

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mi Huan Jun* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mi Huan Jun* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	65	15	13 463
Type C	2	1	3	1975

The substance/substance group *Mi Huan Jun* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9295 %)	81.2500 % (> 77.5000 %)
Type C	99.9218 % (> 99.6430 %)	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
61067	61067	0.00	8.06
61393	61393	0.00	8.37

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mo Yao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50343-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mo Yao; Myrrha resina

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mo Yao	G169H0732621	61957	40	from supplier
PhytoComm	Mo Yao	G169H0732621	61958	40	from supplier

Validation samples

A total of 36 840 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 *Mo Yao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Mo Yao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mo Yao	G169H0732621	61957 [†]	20
PhytoComm	Mo Yao	G169H0732621	61958 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Mo Yao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mo Yao	G1690732222	1
phytocomm	Mo Yao	G169H0732023	1
Phytocomm	Mo Yao	G169H0732122	2

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
PhytoComm	Mo Yao	G169H0732222	2
Phytocomm	Mo Yao	H0732922	1
Caelo	Mo Yao	G169H0732222	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mo Yao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mo Yao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	8	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4414 %)	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
61957	61957	0.00	12.67
61958	61958	0.00	13.56

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mu Dan Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60113-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mu Dan Pi; Moutan cortex radicis

Special notes

When selecting the *Mu Dan Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mu Dan Pi	G166H0741421	61358	40	from supplier
PhytoComm	Mu Dan Pi	G166H0741621	61947	40	from supplier
PhytoComm	Mu Dan Pi	G166H0741621	61948	40	from supplier

Validation samples

A total of 36 840 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 *Mu Dan Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Mu Dan Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mu Dan Pi	G166H0741421	61358 [†]	20
PhytoComm	Mu Dan Pi	G166H0741621	61947 [†]	20
PhytoComm	Mu Dan Pi	G166H0741621	61948 [†]	20

- 13 483 spectra from a total of 316 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.

- 21 spectra from 8 *Apo-Ident* customers from 6 batches from the substance/substance group *Mu Dan Pi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mu Dan Pi	G166H0741321	2
Phytocomm	Mu Dan Pi	G166H0741421	4

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
PhytoComm	Mu Dan Pi	G166H0741022	1
PhytoComm	Mu Dan Pi	G166H0741121	2
Phytocomm	Mu Dan Pi	G166H0741121	5
Phytocomm	Mu Dan Pi	G166H0741122	3
PhytoComm	Mu Dan Pi	G166H0741122	1
PhytoComm	Mu Dan Pi	G166H0741321	2
Phytocomm	Mu Dan Pi	g166j074122	1

- 1960 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	120	0	21 195
Type B	0	60	0	13 483
Type C	1	0	21	1959

The substance/substance group *Mu Dan Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9959 % (> 99.9763 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.9627 % (> 99.6831 %)	0.0000 % ($\geq$ 0.0000 %)

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
61358	61358	0.00	5.32
61947	61947	0.00	6.82
61948	61948	0.00	6.24

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mu Gua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60236-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mu Gua; Chaenomelis lagenariae fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mu Gua	G063H0424521	61696	40	from supplier
PhytoComm	Mu Gua	G063H0424321	61706	40	from supplier
PhytoComm	Mu Gua	G063H0424621	62085	40	from supplier
PhytoComm	Mu Gua	G063H0424621	62086	40	from supplier

Validation samples

A total of 36 840 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 *Mu Gua*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Mu Gua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mu Gua	G063H0424521	61696 [†]	20
PhytoComm	Mu Gua	G063H0424321	61706 [†]	20
PhytoComm	Mu Gua	G063H0424621	62085 [†]	20
PhytoComm	Mu Gua	G063H0424621	62086 [†]	20

- 13 463 spectra from a total of 315 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.

- 8 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Mu Gua*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mu Gua	G063H0424521	4

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
PhytoComm	Mu Gua	G063H0424021	2
PhytoComm	Mu Gua	G063H0424221	1
Phytocomm	Mu Gua	G063H0424221	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mu Gua* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mu Gua* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	4	80	0	13 459
Type C	6	7	1	1967

The substance/substance group *Mu Gua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	99.9877 % (> 99.9524 %)	100.0000 % (> 92.5000 %)
Type C	99.6464 % (> 99.3671 %)	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
61696	61696	0.00	9.55
61706	61706	0.00	14.14
62085	62085	0.00	9.36
62086	62086	0.00	9.04

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Mu Zei**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60123-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mu Zei; Equiseti hiemalis herba

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Mu Zei	G265H0427421	61632	40	from supplier
PhytoComm	Mu Zei	G265H0427421	62057	40	from supplier
PhytoComm	Mu Zei	G265H0427421	62058	40	from supplier

Validation samples

A total of 36 840 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 *Mu Zei*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Mu Zei*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Mu Zei	G265H0427421	61632 [†]	20
PhytoComm	Mu Zei	G265H0427421	62057 [†]	20
PhytoComm	Mu Zei	G265H0427421	62058 [†]	20

- 13 483 spectra from a total of 317 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.

- 4 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Mu Zei*.

Supplier	Substance	Batch	Spectra
Phytocomm	Mu Zei	G265H0427421	1
Phytocomm	Mu Zei	G265H0427823	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
PhytoComm	Mu Zei	G265H0427823	1
PhytoComm	Mu Zei	H0427822	1

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mu Zei* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mu Zei* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	8	1	3	1969

The substance/substance group *Mu Zei* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.7156 % (> 99.4369 %)	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
61632	61632	0.00	12.80
62057	62057	0.00	8.42
62058	62058	0.00	8.09

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Niu Bang Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60161-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Niu Bang Zi; Arctii fructus; Arctii lappae fructus

Special notes

When selecting the *Niu Bang Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Niu Bang Zi	G026H0433521	61677	40	from supplier
PhytoComm	Niu Bang Zi	G026H0433521	61744	41	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 81 spectra of 2 reference samples from the substance/substance group *Niu Bang Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 235 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Niu Bang Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Niu Bang Zi	G026H0433521	61677 [†]	20
PhytoComm	Niu Bang Zi	G026H0433521	61744 [†]	20

- 13 503 spectra from a total of 317 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.

- 14 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Niu Bang Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Niu Bang Zi	G026H0433321	1
Phytocomm	Niu Bang Zi	G026H0433321	1
phytocomm	Niu Bang Zi	g026h0433321	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
Phytocomm	Niu Bang Zi	G026H0433521	3
Phytocomm	Niu Bang Zi	G026H0433222	2
PhytoComm	Niu Bang Zi	G026H0433222	1
PhytoComm	Niu Bang Zi	H0433021	1
Phytocomm	Niu Bang Zi	H0433021	3

- 1967 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	81	0	21 235
Type B	0	40	0	13 503
Type C	0	3	11	1967

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5926 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4409 %)	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
61677	61677	0.00	9.37
61744	61744	0.00	11.40

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Nü Zhen Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60065-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Nü Zhen Zi; Ligustri lucidi fructus

Special notes

When selecting the *Nü Zhen Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Nü Zhen Zi	G138H0345421	61510	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Nü Zhen Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Nü Zhen Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Nü Zhen Zi	G138H0345421	61219	75

- 13 468 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Nü Zhen Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Nü Zhen Zi	420319901	2
PhytoComm	Nü Zhen Zi	G138H0345321	1
PhytoComm	Nü Zhen Zi	H0345021	1
Phytocomm	Nü Zhen Zi	G138H0345421	1
PhytoComm	Nü Zhen Zi	420319901	1
PhytoComm	Nü Zhen Zi	h0345021	1

- 1974 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	75	0	13 468
Type C	0	1	6	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	100.0000 % (> 99.4415 %)	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
61510	61510	0.00	10.34

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Pi Pa Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60201-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pi Pa Ye; Eriobotryae japonicae folium

Special notes

When selecting the *Pi Pa Ye* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Pi Pa Ye	G099H0832521	61681	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Pi Pa Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Pi Pa Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Pi Pa Ye	G099H0832521	61681 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Pi Pa Ye*.

Supplier	Substance	Batch	Spectra
PhytoComm	Pi Pa Ye	G099H0832221	1
Phytocomm	Pi Pa Ye	G099H0832221	1
Herbasinica	Pi Pa Ye	G099H0832221	1
PhytoComm	Pi Pa Ye	H0832922	2

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

- 1976 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	6	0	5	1970

The substance/substance group *Pi Pa Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.7444 % (> 99.4654 %)	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
61681	61681	0.00	6.51

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Pu Huang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60066-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pu Huang; Typhae pollen

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Pu Huang	G245H1316521	61794	40	from supplier
PhytoComm	Pu Huang	G245H1316521	61810	40	from supplier

Validation samples

A total of 36 840 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 *Pu Huang*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Pu Huang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Pu Huang	G245H1316521	61794 [†]	20
PhytoComm	Pu Huang	G245H1316521	61810 [†]	20

- 13 503 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 1 batches from the substance/substance group *Pu Huang*.

Supplier	Substance	Batch	Spectra
phytocomm	Pu Huang	H1316021	1
Phytocomm	Pu Huang	H1316021	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*.

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pu Huang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pu Huang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	2	1977

The substance/substance group *Pu Huang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8721 % (> 99.5943 %)	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
61794	61794	0.00	11.00
61810	61810	0.00	10.65

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Qian Hu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60495-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Qian Hu; Peucedani radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Qian Hu	G185H0926421	61381	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Qian Hu*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Qian Hu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Qian Hu	G185H0926421	61381 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Qian Hu*.

Supplier	Substance	Batch	Spectra
PhytoComm	Qian Hu	H0926021	1
Phytocomm	Qian Hu	G185H0926322	2
Phytocomm	Qian Hu	G185H0926121	1
Phytocomm	Qian Hu	H0926021	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
61381	61381	0.00	9.74

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Qiang Huo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60109-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Qiang Huo; Notopterygii rhizoma et radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Qiang Huo	G172H0840521	61789	40	from supplier
PhytoComm	Qiang Huo	G172H0840521	61808	40	from supplier

Validation samples

A total of 36 840 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 *Qiang Huo*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Qiang Huo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Qiang Huo	G172H0840521	61789 [†]	20
PhytoComm	Qiang Huo	G172H0840521	61808 [†]	20

- 13 503 spectra from a total of 317 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.

- 5 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group *Qiang Huo*.

Supplier	Substance	Batch	Spectra
PhytoComm	Qiang Huo	G172H0840321	1
Phytocomm	Qiang Huo	G172H0840321	1
Phytocomm	Qiang Huo	g172h0841321	1
PhytoComm	Qiang Huo	H0840922	2

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

- 1976 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Qiang Huo* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Qiang Huo* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	39	1	13 503
Type C	2	0	5	1974

The substance/substance group *Qiang Huo* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	97.5000 % (> 90.0000 %)
Type C	99.8134 % (> 99.5344 %)	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
61789	61789	0.00	5.91
61808	61808	0.00	5.36

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Qin Jiao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60222-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Qin Jiao; Gentianae macrophyllae radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Qin Jiao	G113H1059521	61772	40	from supplier
PhytoComm	Qin Jiao	G113H1059521	61814	40	from supplier

Validation samples

A total of 36 840 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 *Qin Jiao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Qin Jiao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Qin Jiao	G113H1059521	61772 [†]	20
PhytoComm	Qin Jiao	G113H1059521	61814 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Qin Jiao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Qin Jiao	G113H1059022	2
PhytoComm	Qin Jiao	G113H1059022	1
Phytocomm	Qin Jiao	G113H1059121	2

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
PhytoComm	Qin Jiao	G113H1059321	1
PhytoComm	Qin Jiao	G113H1059121	1
PhytoComm	Qin Jiao	H1059922	1

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Qin Jiao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Qin Jiao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	7	0	8	1966

The substance/substance group *Qin Jiao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.7169 % (> 99.4375 %)	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
61772	61772	0.00	15.15
61814	61814	0.00	16.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Qing Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50371-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Qing Pi; Citri reticulatae viride pericarpium

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Qing Pi	G074H0809621	62041	40	from supplier
PhytoComm	Qing Pi	G074H0809621	62042	40	from supplier

Validation samples

A total of 36 840 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 *Qing Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Qing Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Qing Pi	G074H0809621	62041 [†]	20
PhytoComm	Qing Pi	G074H0809621	62042 [†]	20

- 13 503 spectra from a total of 317 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.

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

Supplier	Substance	Batch	Spectra
PhytoComm	Qing Pi	G074H100713	2
Phytocomm	Qing Pi	G074H100713	2
Phytocomm	Qing Pi	g074h100713	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Qing Pi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Qing Pi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
62041	62041	0.00	8.55
62042	62042	0.00	8.66

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ren Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60984-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ren Shen; Ginseng radix et rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ren Shen	G115H0562621	61839	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ren Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ren Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ren Shen	G115H0562621	61839 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Ren Shen*.

Supplier	Substance	Batch	Spectra
phythocom	Ren Shen	115h562121	1
phythocom	Ren Shen	g115h0562121	1
PhytoComm	Ren Shen	G1150562121	1
PhytoComm	Ren Shen	G115H0562121	1
PhytoComm	Ren Shen	g115ho562121	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
61839	61839	0.00	9.36

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group	Rou Cong Rong
Substance class	TCM - Granulated herbal extracts (PhytoComm)
Report date	04/07/2017
Report number	60182-2017-07-04
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Rou Cong Rong; Cistanchis herba

Special notes

When selecting the *Rou Cong Rong* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Rou Cong Rong	G072H1460621	61834	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Rou Cong Rong*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Rou Cong Rong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Rou Cong Rong	G072H1460621	61834 [†]	20

- 13 523 spectra from a total of 317 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.

- 3 spectra from 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Rou Cong Rong*.

Supplier	Substance	Batch	Spectra
PhytoComm	Rou Cong Rong	G072H1460321	1
Bios	Rou Cong Rong	434550	1
PhytoComm	Rou Cong Rong	444151	1

- 1978 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 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 *Rou Cong Rong* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Rou Cong Rong* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	0	3	1977

The substance/substance group *Rou Cong Rong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9378 % (> 99.6594 %)	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
61834	61834	0.00	16.92

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ru Xiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50370-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ru Xiang; Olibanum

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ru Xiang	G174H0820421	61048	40	from supplier
PhytoComm	Ru Xiang	G174H0820421	61481	40	from supplier
PhytoComm	Ru Xiang	G174H0820421	61755	40	from supplier
PhytoComm	Ru Xiang	G174H0820621	61935	40	from supplier
PhytoComm	Ru Xiang	G174H0820621	61936	40	from supplier

Validation samples

A total of 36 840 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 *Ru Xiang*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Ru Xiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ru Xiang	G174H0820421	61189	75
PhytoComm	Ru Xiang	G174H0820421	61755 [†]	20
PhytoComm	Ru Xiang	G174H0820621	61935 [†]	20
PhytoComm	Ru Xiang	G174H0820621	61936 [†]	20

- 13 408 spectra from a total of 316 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.

- 7 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Ru Xiang*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ru Xiang	G174H0820421	2

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
Phytocomm	Ru Xiang	G174H0820421	1
Phytocomm	Ru Xiang	G174H0820231	1
Phytocomm	Ru Xiang	G174H0820123	1
PhytoComm	Ru Xiang	G174H0820321	1
PhytoComm	Ru Xiang	H0820923	1

- 1974 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ru Xiang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ru Xiang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	135	0	13 408
Type C	0	4	3	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	100.0000 % (> 99.4415 %)	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
61048	61048	0.00	30.90
61481	61481	0.00	30.36
61755	61755	0.00	29.12
61935	61935	0.00	73.37
61936	61936	0.00	74.53

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **San Leng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60029-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

San Leng; Sparganii rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	San Leng	G270H0311522	61889	40	from supplier
PhytoComm	San Leng	G270H0311522	61890	40	from supplier

Validation samples

A total of 36 840 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 *San Leng*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *San Leng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	San Leng	G270H0311522	61889 [†]	20
PhytoComm	San Leng	G270H0311522	61890 [†]	20

- 13 503 spectra from a total of 317 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.

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

Supplier	Substance	Batch	Spectra
Phytocomm	San Leng	G270H0311121	1
PhytoComm	San Leng	G270H0311221	1
Phytocomm	San Leng	g270h0311221	1
Phytocomm	San Leng	H0311922	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*.

- 1977 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	3	78	2	21 233
Type B	2	38	2	13 501
Type C	1	0	4	1976

The substance/substance group *San Leng* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9876 % (> 99.9680 %)	97.5000 % (> 93.7500 %)
Type B	99.9836 % (> 99.9484 %)	95.0000 % (> 87.5000 %)
Type C	99.9689 % (> 99.6901 %)	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
61889	61889	0.00	4.18
61890	61890	0.00	4.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **San Qi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60415-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

San Qi; Notoginseng radix; Pseudoginseng radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	San Qi	G203H0312321	60916	40	from supplier
PhytoComm	San Qi	G203H0312321	61460	40	from supplier
PhytoComm	San Qi	G203H0312321	61765	40	from supplier
PhytoComm	San Qi	G203H0312421	61793	40	from supplier
PhytoComm	San Qi	G203H0312421	61805	40	from supplier

Validation samples

A total of 36 840 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 *San Qi*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *San Qi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	San Qi	G203H0312321	61168	75
PhytoComm	San Qi	G203H0312321	61765 [†]	20
PhytoComm	San Qi	G203H0312421	61793 [†]	20
PhytoComm	San Qi	G203H0312421	61805 [†]	20

- 13 408 spectra from a total of 316 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.

- 4 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *San Qi*.

Supplier	Substance	Batch	Spectra
phytocomm	San Qi	G203H0312021	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
PhytoComm	San Qi	G203H0312021	2
Phytocomm	San Qi	g203h0312021	1

- 1977 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *San Qi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *San Qi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	135	0	13 408
Type C	1	0	4	1976

The substance/substance group *San Qi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	99.9534 % (> 99.6746 %)	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
60916	60916	0.00	8.90

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
61460	61460	0.00	7.53
61765	61765	0.00	7.79
61793	61793	0.00	9.59
61805	61805	0.00	9.01

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sang Bai Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50287-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sang Bai Pi; Mori cortex

Special notes

When selecting the *Sang Bai Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sang Bai Pi	G161H1042621	61989	40	from supplier
PhytoComm	Sang Bai Pi	G161H1042621	61990	40	from supplier

Validation samples

A total of 36 840 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 *Sang Bai Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Sang Bai Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sang Bai Pi	G161H1042621	61989 [†]	20
PhytoComm	Sang Bai Pi	G161H1042621	61990 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Sang Bai Pi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Sang Bai Pi	G161H1042121	2
PhytoComm	Sang Bai Pi	G161H1042321	1
PhytoComm	Sang Bai Pi	G161H1042321	2

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
Phytocomm	Sang Bai Pi	G161H1042922	1
PhytoComm	Sang Bai Pi	G161H1042922	1

- 1974 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sang Bai Pi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sang Bai Pi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	3	0	7	1971

The substance/substance group *Sang Bai Pi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8632 % (> 99.5840 %)	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
61989	61989	0.00	11.65
61990	61990	0.00	11.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sang Ji Shend**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60142-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sang Ji Shend; Taxilli herba

Special notes

When selecting the *Sang Ji Shend* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sang Ji Shend	G146H1045621	61991	40	from supplier
PhytoComm	Sang Ji Shend	G146H1045621	61992	40	from supplier

Validation samples

A total of 36 840 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 *Sang Ji Shend*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Sang Ji Shend*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sang Ji Shend	G146H1045621	61991 [†]	20
PhytoComm	Sang Ji Shend	G146H1045621	61992 [†]	20

- 13 503 spectra from a total of 317 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.

- 11 spectra from 9 *Apo-Ident* customers from 5 batches from the substance/substance group *Sang Ji Shend*.

Supplier	Substance	Batch	Spectra
PhytoComm	Sang Ji Shend	G146H1045322	1
Herbasinica	Sang Ji Shend	G146H1045322	1
Phytocomm	Sang Ji Shend	G146H1045522	4

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
Phytocomm	Sang Ji Shend	G146H1045222	1
PhytoComm	Sang Ji Shend	G146H1045222	1
Phytocomm	Sang Ji Shend	g146h1045222	1
Phytocomm	Sang Ji Shend	H1045021	2

- 1970 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sang Ji Shend* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sang Ji Shend* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	1	10	1969

The substance/substance group *Sang Ji Shend* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9585 % (> 99.6791 %)	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
61991	61991	0.00	12.04
61992	61992	0.00	12.19

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sang Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60022-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sang Shen; Mori fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sang Shen	G163FB1047621	61836	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Sang Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Sang Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sang Shen	G163FB1047621	61836 [†]	20

- 13 523 spectra from a total of 317 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.

- 5 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Sang Shen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Sang Shen	G163H1047121	2
PhytoComm	Sang Shen	G163H1047221	1
Phytocomm	Sang Shen	G163H1047221	1
PhytoComm	Sang Shen	H1047921	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*.

- 1976 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	5	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4420 %)	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
61836	61836	0.00	11.85

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sang Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60079-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sang Ye; Mori albi folium

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sang Ye	G162H1043621	61973	40	from supplier
PhytoComm	Sang Ye	G162H1043621	61974	40	from supplier

Validation samples

A total of 36 840 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 *Sang Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Sang Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sang Ye	G162H1043621	61973 [†]	20
PhytoComm	Sang Ye	G162H1043621	61974 [†]	20

- 13 503 spectra from a total of 317 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.

- 10 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Sang Ye*.

Supplier	Substance	Batch	Spectra
Phytocomm	Sang Ye	421013801	1
Phytocomm	Sang Ye	G162H1043421	3
PhytoComm	Sang Ye	G162H1043121	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
PhytoComm	Sang Ye	G162H1043121	4
PhytoComm	Sang Ye	H1043021	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sang Ye* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sang Ye* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	10	1969

The substance/substance group *Sang Ye* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8934 % (> 99.6140 %)	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
61973	61973	0.00	16.08
61974	61974	0.00	16.86

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sang Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60091-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sang Zhi; Mori albae ramulus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sang Zhi	G164H1044421	61366	40	from supplier
PhytoComm	Sang Zhi	G164H1044621	61969	40	from supplier
PhytoComm	Sang Zhi	G164H1044621	61970	40	from supplier

Validation samples

A total of 36 840 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 *Sang Zhi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Sang Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sang Zhi	G164H1044421	61366 [†]	20
PhytoComm	Sang Zhi	G164H1044621	61969 [†]	20
PhytoComm	Sang Zhi	G164H1044621	61970 [†]	20

- 13 483 spectra from a total of 316 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.

- 9 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Sang Zhi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Sang Zhi	G164H1044022	4
Phytocomm	Sang Zhi	G164H1044221	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
PhytoComm	Sang Zhi	G164H1044221	1
PhytoComm	Sang Zhi	H1044921	2
PhytoComm	Sang Zhi	G164H1044022	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	120	0	21 195
Type B	0	60	0	13 483
Type C	5	0	9	1967

The substance/substance group *Sang Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9959 % (> 99.9763 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.8186 % (> 99.5393 %)	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
61366	61366	0.00	7.81
61969	61969	0.00	8.37
61970	61970	0.00	8.11

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sha Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60184-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sha Ren; Amomi villosi fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sha Ren	G018H0939522	61703	40	from supplier
PhytoComm	Sha Ren	G018H0939523	61799	40	from supplier
PhytoComm	Sha Ren	G018H0939523	61818	40	from supplier
PhytoComm	Sha Ren	G018H0939622	62095	40	from supplier
PhytoComm	Sha Ren	G018H0939622	62096	40	from supplier

Validation samples

A total of 36 840 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 *Sha Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 5 reference samples from the substance/substance group *Sha Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sha Ren	G018H0939522	61703 [†]	20
PhytoComm	Sha Ren	G018H0939523	61799 [†]	20
PhytoComm	Sha Ren	G018H0939523	61818 [†]	20
PhytoComm	Sha Ren	G018H0939622	62095 [†]	20
PhytoComm	Sha Ren	G018H0939622	62096 [†]	20

- 13 443 spectra from a total of 315 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.

- 12 spectra from 8 *Apo-Ident* customers from 5 batches from the substance/substance group *Sha Ren*.

[†]These spectra were recorded from 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
Phytocomm	Sha Ren	G018H0939522	1
PhytoComm	Sha Ren	G018H0939321	1
PhytoComm	Sha Ren	G018H0939523	1
Phytocomm	Sha Ren	G018H0939321	1
Phytocomm	Sha Ren	g018h0939321	1
PhytoComm	Sha Ren	H0939022	4
Phytocomm	Sha Ren	H0939022	2
Euro OTC	Sha Ren	H0939022	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sha Ren* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sha Ren* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	100	0	13 443
Type C	5	4	8	1964

The substance/substance group *Sha Ren* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 94.0000 %)
Type C	99.7264 % (> 99.4469 %)	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
61703	61703	0.00	10.68
61799	61799	0.00	13.47
61818	61818	0.00	14.41
62095	62095	0.00	10.54
62096	62096	0.00	10.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sha Shen (Bei)**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60200-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sha Shen (Bei); Glehniae radix

Special notes

When selecting the *Sha Shen (Bei)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sha Shen (Bei)	G117H0754322	61517	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Sha Shen (Bei)*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Sha Shen (Bei)*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sha Shen (Bei)	G117H0754322	61226	75

- 13 468 spectra from a total of 317 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.

- 11 spectra from 5 *Apo-Ident* customers from 2 batches from the substance/substance group *Sha Shen (Bei)*.

Supplier	Substance	Batch	Spectra
Herbasin	Sha Shen (Bei)	G117H0754121	4
PhytoComm	Sha Shen (Bei)	G117H0754121	3
Phytocomm	Sha Shen (Bei)	G117H0754322	3
Herbasinica	Sha Shen (Bei)	G117H0754121	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	75	0	13 468
Type C	1	3	8	1969

The substance/substance group *Sha Shen (Bei)* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.9689 % (> 99.6895 %)	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
61517	61517	0.00	7.18

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shan Yao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60207-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shan Yao; Dioscoreae oppositae rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shan Yao	G091H0330622	62009	40	from supplier
PhytoComm	Shan Yao	G091H0330622	62010	40	from supplier

Validation samples

A total of 36 840 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 *Shan Yao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Shan Yao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shan Yao	G091H0330622	62009 [†]	20
PhytoComm	Shan Yao	G091H0330622	62010 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Shan Yao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Shan Yao	G091H0330521	2
PhytoComm	Shan Yao	G091H0330521	2
PhytoComm	Shan Yao	G091H0330122	1
PhytoComm	Shan Yao	H0330021	2

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

- 1974 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shan Yao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shan Yao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	5	0	7	1969

The substance/substance group *Shan Yao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.6002 % (> 99.3210 %)	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
62009	62009	0.00	11.24
62010	62010	0.00	11.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shan Yu Rou**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60226-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shan Yu Rou; Corni officinalis fructus

Special notes

When selecting the *Shan Yu Rou* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shan Yu Rou	G080H0333421	61723	40	from supplier
PhytoComm	Shan Yu Rou	G080H0333621	62011	40	from supplier
PhytoComm	Shan Yu Rou	G080H0333621	62012	40	from supplier

Validation samples

A total of 36 840 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 *Shan Yu Rou*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Shan Yu Rou*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shan Yu Rou	G080H0333421	61723 [†]	20
PhytoComm	Shan Yu Rou	G080H0333621	62011 [†]	20
PhytoComm	Shan Yu Rou	G080H0333621	62012 [†]	20

- 13 483 spectra from a total of 316 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.

- 10 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Shan Yu Rou*.

Supplier	Substance	Batch	Spectra
PhytoComm	Shan Yu Rou	G080H0333421	1
PhytoComm	Shan Yu Rou	G080H0333021	2

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
Phytocomm	Shan Yu Rou	G080H0333021	1
Phytocomm	Shan Yu Rou	G080H0333121	2
PhytoComm	Shan Yu Rou	G080H0333121	1
PhytoComm	Shan Yu Rou	G080H033321	1
Phytocomm	Shan Yu Rou	G080H0333221	1
Phytocomm	Shan Yu Rou	g080h0333221	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shan Yu Rou* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shan Yu Rou* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	1	60	0	13 482
Type C	21	3	7	1950

The substance/substance group *Shan Yu Rou* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	99.9918 % (> 99.9566 %)	100.0000 % (> 90.0000 %)
Type C	99.0352 % (> 98.7558 %)	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
61723	61723	0.00	9.04
62011	62011	0.00	10.19
62012	62012	0.00	9.67

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shan Zha**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60192-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shan Zha; Crataegi fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shan Zha	G082H0331522	62029	40	from supplier
PhytoComm	Shan Zha	G082H0331522	62030	40	from supplier

Validation samples

A total of 36 840 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 *Shan Zha*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Shan Zha*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shan Zha	G082H0331522	62029 [†]	20
PhytoComm	Shan Zha	G082H0331522	62030 [†]	20

- 13 503 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Shan Zha*.

Supplier	Substance	Batch	Spectra
Phytocomm	Shan Zha	G082H0331521	1
phytocomm	Shan Zha	G082H0331022	1
PhytoComm	Shan Zha	G082H0331022	4

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
Phytocomm	Shan Zha	G082H0331022	1
Phytocomm	Shan Zha	G082H0331324	1
PhytoComm	Shan Zha	G082H0331324	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shan Zha* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shan Zha* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	0	9	1971

The substance/substance group *Shan Zha* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9733 % (> 99.6940 %)	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
62029	62029	0.00	7.79
62030	62030	0.00	7.19

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **She Gan**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60335-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

She Gan; Belamcandae rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	She Gan	G048H1034422	61682	40	from supplier
PhytoComm	She Gan	G048H1034621	61771	40	from supplier
PhytoComm	She Gan	G048H1034621	61828	40	from supplier

Validation samples

A total of 36 840 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 *She Gan*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *She Gan*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	She Gan	G048H1034422	61682 [†]	20
PhytoComm	She Gan	G048H1034621	61771 [†]	20
PhytoComm	She Gan	G048H1034621	61828 [†]	20

- 13 483 spectra from a total of 316 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.

- 6 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *She Gan*.

Supplier	Substance	Batch	Spectra
Phytocomm	She Gan	G048H1034422	1
PhytoComm	She Gan	G048H1034021	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
Phytocomm	She Gan	G048H1034021	2
Phytocomm	She Gan	G048H1034122	2

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	119	1	21 196
Type B	3	59	1	13 480
Type C	12	1	5	1963

The substance/substance group *She Gan* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	99.1667 % (> 96.6667 %)
Type B	99.9860 % (> 99.9508 %)	98.3333 % (> 93.3333 %)
Type C	99.6713 % (> 99.3922 %)	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
61682	61682	0.00	6.20
61771	61771	0.00	4.83
61828	61828	0.00	5.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shen Qu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60020-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shen Qu; Massa fermentata medicinalis

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shen Qu	G156H0935421	61025	40	from supplier
PhytoComm	Shen Qu	G156H0935421	61494	40	from supplier
PhytoComm	Shen Qu	G156H0935521	61665	40	from supplier
PhytoComm	Shen Qu	G156H0935522	61971	40	from supplier
PhytoComm	Shen Qu	G156H0935522	61972	40	from supplier

Validation samples

A total of 36 840 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 *Shen Qu*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Shen Qu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shen Qu	G156H0935421	61202	75
PhytoComm	Shen Qu	G156H0935521	61665 [†]	20
PhytoComm	Shen Qu	G156H0935522	61971 [†]	20
PhytoComm	Shen Qu	G156H0935522	61972 [†]	20

- 13 408 spectra from a total of 315 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.

- 8 spectra from 4 *Apo-Ident* customers from 5 batches from the substance/substance group *Shen Qu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Shen Qu	G156H0935521	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*.

continued from previous page

Supplier	Substance	Batch	Spectra
phytocomm	Shen Qu	G156H0935023	1
PhytoComm	Shen Qu	G156H0935521	1
Phytocomm	Shen Qu	G156H0935023	1
PhytoComm	Shen Qu	G156H0935121	1
phytocomm	Shen Qu	g156h0935421	1
PhytoComm	Shen Qu	H0935021	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shen Qu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shen Qu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	135	0	13 408
Type C	0	4	4	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	100.0000 % (> 99.4414 %)	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
61025	61025	0.00	18.00
61494	61494	0.00	19.54
61665	61665	0.00	16.69
61971	61971	0.00	16.26
61972	61972	0.00	16.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sheng Jiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60017-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sheng Jiang; Zingiberis rhizoma recens

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sheng Jiang	G253H0534421	60991	40	from supplier
PhytoComm	Sheng Jiang	G253H0534421	61414	40	from supplier
PhytoComm	Sheng Jiang	G253H0534522	61650	40	from supplier

Validation samples

A total of 36 840 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 *Sheng Jiang*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Sheng Jiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sheng Jiang	G253H0534421	61122	75
PhytoComm	Sheng Jiang	G253H0534522	61650 [†]	20

- 13 448 spectra from a total of 316 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.

- 11 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Sheng Jiang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Sheng Jiang	G253H0534522	1
PhytoComm	Sheng Jiang	G253H0534522	3
Phytocomm	Sheng Jiang	G253H0534221	2

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
PhytoComm	Sheng Jiang	G253H0534221	1
PhytoComm	Sheng Jiang	G253H0534321	2
PhytoComm	Sheng Jiang	H0534022	1
Phytocomm	Sheng Jiang	H0534022	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	120	0	21 195
Type B	5	95	0	13 443
Type C	2	3	8	1968

The substance/substance group *Sheng Jiang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9938 % (> 99.9742 %)	100.0000 % (> 95.0000 %)
Type B	99.9692 % (> 99.9339 %)	100.0000 % (> 93.6842 %)
Type C	99.9171 % (> 99.6376 %)	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
60991	60991	0.00	6.08
61414	61414	0.00	6.09
61650	61650	0.00	10.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Sheng Ma**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60216-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sheng Ma; Cimicifugae rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Sheng Ma	G068H0437621	62079	40	from supplier
PhytoComm	Sheng Ma	G068H0437621	62080	40	from supplier

Validation samples

A total of 36 840 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 *Sheng Ma*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Sheng Ma*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Sheng Ma	G068H0437621	62079 [†]	20
PhytoComm	Sheng Ma	G068H0437621	62080 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Sheng Ma*.

Supplier	Substance	Batch	Spectra
Phytocomm	Sheng Ma	G068H0437421	2
Phytocomm	Sheng Ma	g068h04317121	1
PhytoComm	Sheng Ma	G068H0437021	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
PhytoComm	Sheng Ma	G068H0437121	1
PhytoComm	Sheng Ma	G068H0437121	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sheng Ma* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sheng Ma* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	38	2	13 503
Type C	2	0	7	1972

The substance/substance group *Sheng Ma* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	95.0000 % (> 87.5000 %)
Type C	99.9350 % (> 99.6558 %)	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
62079	62079	0.00	8.96
62080	62080	0.00	8.90

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shi Gao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50368-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shi Gao; Gypsum fibrosum

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shi Gao	G120H0541522	61843	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Shi Gao*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Shi Gao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shi Gao	G120H0541522	61843 [†]	20

- 13 523 spectra from a total of 317 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.

- 19 spectra from 7 *Apo-Ident* customers from 4 batches from the substance/substance group *Shi Gao*.

Supplier	Substance	Batch	Spectra
phythocom	Shi Gao	G120H0541223	2
phytocomm	Shi Gao	g120h541024	1
Phytocomm	Shi Gao	G120H0541024	9
Phytocomm	Shi Gao	G120H051024	1
PhytoComm	Shi Gao	G120H0541024	2
Phytocomm	Shi Gao	G120H0541223	3
PhytoComm	Shi Gao	G120H0541223	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*.

- 1962 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	19	1962

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4408 %)	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
61843	61843	0.00	513.08

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shi Jun Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60793-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shi Jun Zi; Quisqualis fructus

Special notes

When selecting the *Shi Jun Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shi Jun Zi	G208H0869521	61648	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Shi Jun Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Shi Jun Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shi Jun Zi	G208H0869521	61648 [†]	20

- 13 523 spectra from a total of 317 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.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Shi Jun Zi*.
- 1981 spectra from 16 *Apo-Ident* customers from a total of 964 batches from a further 268 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shi Jun Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant

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

spectra of the various substances were compared with *Shi Jun Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	0	0	1980

The substance/substance group *Shi Jun Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9804 % (> 99.7005 %)	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
61648	61648	0.00	12.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shi Wei**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50363-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shi Wei; Pyrrosiae folium

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shi Wei	G298HS0800N1	61672	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Shi Wei*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Shi Wei*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shi Wei	G298HS0800N1	61672 [†]	20

- 13 523 spectra from a total of 317 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.

- 2 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Shi Wei*.

Supplier	Substance	Batch	Spectra
Phytocomm	Shi Wei	H0543021	2

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Shi Wei* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shi Wei* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	2	40	0	21 274
Type B	2	20	0	13 521
Type C	0	0	2	1979

The substance/substance group *Shi Wei* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	99.9751 % (> 99.9557 %)	100.0000 % (> 85.0000 %)
Type B	99.9954 % (> 99.9604 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61672	61672	0.00	4.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Shu Di (Huang)**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60006-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Shu Di (Huang); Rehmanniae praeparata radix; Rehmanniae radix praep.

Special notes

When selecting the *Shu Di (Huang)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Shu Di (Huang)	G210H1601421	61456	40	from supplier
PhytoComm	Shu Di (Huang)	G210H1601521	61749	40	from supplier
PhytoComm	Shu Di (Huang)	G210H1601521	62061	40	from supplier
PhytoComm	Shu Di (Huang)	G210H1601521	62062	40	from supplier

Validation samples

A total of 36 840 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 *Shu Di (Huang)*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Shu Di (Huang)*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Shu Di (Huang)	G210H1601421	61164	75
PhytoComm	Shu Di (Huang)	G210H1601521	61749 [†]	20
PhytoComm	Shu Di (Huang)	G210H1601521	62061 [†]	20
PhytoComm	Shu Di (Huang)	G210H1601521	62062 [†]	20

- 13 408 spectra from a total of 316 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.

- 19 spectra from 9 *Apo-Ident* customers from 6 batches from the substance/substance group *Shu Di (Huang)*.

Supplier	Substance	Batch	Spectra
Phytocomm	Shu Di (Huang)	G210H1601421	5

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
Phytocomm	Shu Di (Huang)	G210H1601521	3
PhytoComm	Shu Di (Huang)	G210H1601121	3
PhytoComm	Shu Di (Huang)	G210H1601221	1
Phytocomm	Shu Di (Huang)	G210H1601221	1
Phytocomm	Shu Di (Huang)	g210h1601221	4
Phytocomm	Shu Di (Huang)	G210H1601121	1
PhytoComm	Shu Di (Huang)	H1601021	1

- 1962 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Shu Di (Huang)* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Shu Di (Huang)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	135	0	13 408
Type C	12	9	10	1950

The substance/substance group *Shu Di (Huang)* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	99.6956 % (> 99.4160 %)	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
61456	61456	0.00	13.18
61749	61749	0.00	12.96
62061	62061	0.00	7.33
62062	62062	0.00	7.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Suan Zao Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60059-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Suan Zao Ren; Zizyphi spinosae semen

Special notes

When selecting the *Suan Zao Ren* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Suan Zao Ren	G254H1418322	60993	50	from supplier
PhytoComm	Suan Zao Ren	G254H1418421	61071	40	from supplier
PhytoComm	Suan Zao Ren	G254H1418421	61417	40	from supplier
PhytoComm	Suan Zao Ren	G254H1418621	61893	40	from supplier
PhytoComm	Suan Zao Ren	G254H1418621	61894	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 210 spectra of 5 reference samples from the substance/substance group *Suan Zao Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 106 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 145 spectra of 5 reference samples from the substance/substance group *Suan Zao Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Suan Zao Ren	G254H1418322	60993 [†]	10
PhytoComm	Suan Zao Ren	G254H1418421	61071 [†]	20
PhytoComm	Suan Zao Ren	G254H1418421	61125	75
PhytoComm	Suan Zao Ren	G254H1418621	61893 [†]	20
PhytoComm	Suan Zao Ren	G254H1418621	61894 [†]	20

- 13 398 spectra from a total of 315 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.

- 6 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Suan Zao Ren*.

[†]These spectra were recorded from 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
Phytocomm	Suan Zao Ren	G254H1418421	1
Phytocomm	Suan Zao Ren	G254H1418121	2
Phytocomm	Suan Zao Ren	g254h1418121	2
PhytoComm	Suan Zao Ren	G254H1418121	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	210	0	21 106
Type B	0	145	0	13 398
Type C	0	1	5	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.1429 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.8621 %)
Type C	100.0000 % (> 99.4417 %)	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
60993	60993	0.00	25.31

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Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
61071	61071	0.00	26.77
61417	61417	0.00	25.12
61893	61893	0.00	18.22
61894	61894	0.00	18.42

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Suo Yang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60117-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Suo Yang; Cynomorii songarici herba

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Suo Yang	G260H1831521	61781	40	from supplier
PhytoComm	Suo Yang	G260H1831521	61807	40	from supplier

Validation samples

A total of 36 840 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 *Suo Yang*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Suo Yang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Suo Yang	G260H1831521	61781 [†]	20
PhytoComm	Suo Yang	G260H1831521	61807 [†]	20

- 13 503 spectra from a total of 317 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.

- 3 spectra from 2 *Apo-Ident* customers from 2 batches from the substance/substance group *Suo Yang*.

Supplier	Substance	Batch	Spectra
phytoComm	Suo Yang	G260H1439022	1
Phytocomm	Suo Yang	G260H1831121	1
PhytoComm	Suo Yang	G260H1831121	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*.

- 1978 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Suo Yang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Suo Yang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	3	1978

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4431 %)	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
61781	61781	0.00	20.23
61807	61807	0.00	19.72

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tai Zi Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60114-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tai Zi Shen; Pseudostellariae heterophyllae radix

Special notes

When selecting the *Tai Zi Shen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tai Zi Shen	G204H0446621	61929	40	from supplier
PhytoComm	Tai Zi Shen	G204H0446621	61930	40	from supplier

Validation samples

A total of 36 840 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 *Tai Zi Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Tai Zi Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tai Zi Shen	G204H0446621	61929 [†]	20
PhytoComm	Tai Zi Shen	G204H0446621	61930 [†]	20

- 13 503 spectra from a total of 317 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.

- 3 spectra from 3 *Apo-Ident* customers from 2 batches from the substance/substance group *Tai Zi Shen*.

Supplier	Substance	Batch	Spectra
PhytoComm	Tai Zi Shen	G204H0446221	1
Phytocomm	Tai Zi Shen	G204H0446221	1
Phytocomm	Tai Zi Shen	G204H0446521	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*.

- 1978 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tai Zi Shen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tai Zi Shen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	3	1978

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4431 %)	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
61929	61929	0.00	12.12
61930	61930	0.00	13.05

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tao Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60454-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tao Ren; Persicae semen

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tao Ren	G184H1007422	61093	40	from supplier
PhytoComm	Tao Ren	G184HS220	61643	40	from supplier
PhytoComm	Tao Ren	G184H1007621	61943	40	from supplier
PhytoComm	Tao Ren	G184H1007621	61944	40	from supplier

Validation samples

A total of 36 840 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 *Tao Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Tao Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tao Ren	G184H1007422	61093 [†]	20
PhytoComm	Tao Ren	G184HS220	61643 [†]	20
PhytoComm	Tao Ren	G184H1007621	61943 [†]	20
PhytoComm	Tao Ren	G184H1007621	61944 [†]	20

- 13 463 spectra from a total of 315 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.

- 7 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Tao Ren*.

Supplier	Substance	Batch	Spectra
phytocomm	Tao Ren	G184H1007023	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
phytocomm	Tao Ren	G184H1007122	2
PhytoComm	Tao Ren	G184H1007122	2
Phytocomm	Tao Ren	g184h1007122	1
PhytoComm	Tao Ren	G184H1007321	1

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tao Ren* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tao Ren* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	0	0	7	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.4415 %)	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
61093	61093	0.00	22.68
61643	61643	0.00	7.92
61943	61943	0.00	45.75
61944	61944	0.00	45.87

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tian Hua Fen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60139-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tian Hua Fen; Trichosanthis radix

Special notes

When selecting the *Tian Hua Fen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tian Hua Fen	G242H0417522	61735	40	from supplier
PhytoComm	Tian Hua Fen	G242H0417621	61905	40	from supplier
PhytoComm	Tian Hua Fen	G242H0417621	61906	40	from supplier

Validation samples

A total of 36 840 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 *Tian Hua Fen*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Tian Hua Fen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tian Hua Fen	G242H0417522	61735 [†]	20
PhytoComm	Tian Hua Fen	G242H0417621	61905 [†]	20
PhytoComm	Tian Hua Fen	G242H0417621	61906 [†]	20

- 13 483 spectra from a total of 316 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.

- 9 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Tian Hua Fen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Tian Hua Fen	G242H0417423	1
Phytocomm	Tian Hua Fen	G242H0417522	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
PhytoComm	Tian Hua Fen	G242H0417522	1
PhytoComm	Tian Hua Fen	G242H0417122	1
PhytoComm	Tian Hua Fen	H0417022	2
Phytocomm	Tian Hua Fen	h0417022	1
Phytocomm	Tian Hua Fen	H0417022	1
phytocomm	Tian Hua Fen	h0417022	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	2	117	3	21 194
Type B	2	58	2	13 481
Type C	0	2	7	1972

The substance/substance group *Tian Hua Fen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9876 % (> 99.9680 %)	97.5000 % (> 95.0000 %)
Type B	99.9754 % (> 99.9401 %)	96.6667 % (> 91.6667 %)
Type C	100.0000 % (> 99.4413 %)	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
61735	61735	0.00	6.67
61905	61905	0.00	4.16
61906	61906	0.00	3.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tian Men Dong**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60156-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tian Men Dong; Asparagi cochinensis radix

Special notes

When selecting the *Tian Men Dong* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tian Men Dong	G037H0415521	61701	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Tian Men Dong*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Tian Men Dong*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tian Men Dong	G037H0415521	61701 [†]	20

- 13 523 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 7 batches from the substance/substance group *Tian Men Dong*.

Supplier	Substance	Batch	Spectra
phythocom	Tian Men Dong	g037h0415021	1
Phytocomm	Tian Men Dong	G037H0415321	1
PhytoComm	Tian Men Dong	G037H0415021	2
PhytoComm	Tian Men Dong	G037H0415121	1
Phytocomm	Tian Men Dong	G037H0415221	1
Phytocomm	Tian Men Dong	G037H0415121	1
Phytocomm	Tian Men Dong	g037h0415221	1
Phytocomm	Tian Men Dong	g03h0415521	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*.

- 1972 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	4	1	8	1968

The substance/substance group *Tian Men Dong* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.8789 % (> 99.5995 %)	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
61701	61701	0.00	7.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tian Nan Xing**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60168-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tian Nan Xing; Arisaematis rhizoma; Arisaematis rhizoma praep.

Special notes

When selecting the *Tian Nan Xing* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tian Nan Xing	G028H0420521	61704	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Tian Nan Xing*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Tian Nan Xing*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tian Nan Xing	G028H0420521	61704 [†]	20

- 13 523 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 1 batches from the substance/substance group *Tian Nan Xing*.

Supplier	Substance	Batch	Spectra
Phytocomm	Tian Nan Xing	G028H0420922	2

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded 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 *Tian Nan Xing* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tian Nan Xing* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	2	1979

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4445 %)	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
61704	61704	0.00	11.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tu Fu Ling**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50885-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tu Fu Ling; Smilacis glabrae rhizoma

Special notes

When selecting the *Tu Fu Ling* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tu Fu Ling	G231H0325421	61094	40	from supplier
PhytoComm	Tu Fu Ling	G231H0325421	61436	40	from supplier
PhytoComm	Tu Fu Ling	G231H0325621	61915	40	from supplier
PhytoComm	Tu Fu Ling	G231H0325621	61916	40	from supplier

Validation samples

A total of 36 840 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 *Tu Fu Ling*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Tu Fu Ling*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tu Fu Ling	G231H0325421	61094 [†]	20
PhytoComm	Tu Fu Ling	G231H0325421	61144	75
PhytoComm	Tu Fu Ling	G231H0325621	61915 [†]	20
PhytoComm	Tu Fu Ling	G231H0325621	61916 [†]	20

- 13 408 spectra from a total of 316 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.

- 9 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Tu Fu Ling*.

Supplier	Substance	Batch	Spectra
Phytocomm	Tu Fu Ling	G231H0325121	5

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
Phytocomm	Tu Fu Ling	G231H0325421	2
PhytoComm	Tu Fu Ling	G231H0325421	1
Phytocomm	Tu Fu Ling	G231H325121	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tu Fu Ling* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tu Fu Ling* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	135	0	13 408
Type C	1	8	1	1971

The substance/substance group *Tu Fu Ling* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	99.9627 % (> 99.6833 %)	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
61094	61094	0.00	8.76
61436	61436	0.00	11.21
61915	61915	0.00	6.99
61916	61916	0.00	7.24

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Tu Si Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60217-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tu Si Zi; Cuscutae semen

Special notes

When selecting the *Tu Si Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Tu Si Zi	G086H1243322	60999	40	from supplier
PhytoComm	Tu Si Zi	G086H1243422	61046	40	from supplier
PhytoComm	Tu Si Zi	G086H1243422	61552	40	from supplier
PhytoComm	Tu Si Zi	G086H1243322	61554	40	from supplier
PhytoComm	Tu Si Zi	G086H1243521	61680	40	from supplier

Validation samples

A total of 36 840 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 *Tu Si Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 116 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 170 spectra of 3 reference samples from the substance/substance group *Tu Si Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Tu Si Zi	G086H1243422	61261	75
PhytoComm	Tu Si Zi	G086H1243322	61263	75
PhytoComm	Tu Si Zi	G086H1243521	61680 [†]	20

- 13 373 spectra from a total of 315 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.

- 9 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Tu Si Zi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Tu Si Zi	G086H1243521	3
PhytoComm	Tu Si Zi	G086H1243521	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
Phytocomm	Tu Si Zi	161213tsz	1
PhytoComm	Tu Si Zi	H1243022	1
Phytocomm	Tu Si Zi	H1243022	1
Phytocomm	Tu Si Zi	h1243022	1
Phytocomm	Tu Si Zi	H1243923	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tu Si Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tu Si Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 116
Type B	0	170	0	13 373
Type C	1	8	1	1971

The substance/substance group *Tu Si Zi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.4706 %)
Type C	99.8134 % (> 99.5341 %)	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
60999	60999	0.00	11.64
61046	61046	0.00	16.73
61552	61552	0.00	16.91
61554	61554	0.00	18.36
61680	61680	0.00	21.13

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Wei Ling Xian**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60543-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wei Ling Xian; Clematidis radix

Special notes

When selecting the *Wei Ling Xian* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Wei Ling Xian	G075H0943521	62031	40	from supplier
PhytoComm	Wei Ling Xian	G075H0943521	62032	40	from supplier

Validation samples

A total of 36 840 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 *Wei Ling Xian*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Wei Ling Xian*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Wei Ling Xian	G075H0943521	62031 [†]	20
PhytoComm	Wei Ling Xian	G075H0943521	62032 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Wei Ling Xian*.

Supplier	Substance	Batch	Spectra
Phytocomm	Wei Ling Xian	G075H0943223	2
Phytocomm	Wei Ling Xian	g075h0943223	1
PhytoComm	Wei Ling Xian	420905402	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
Phytocomm	Wei Ling Xian	G075H0943422	1
PhytoComm	Wei Ling Xian	G075H0943223	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wei Ling Xian* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wei Ling Xian* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	8	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4414 %)	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
62031	62031	0.00	13.88
62032	62032	0.00	12.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Wu Jia Pi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60149-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wu Jia Pi; Acanthopanax cortex; Acanthopanax cortex radiceis

Special notes

When selecting the *Wu Jia Pi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Wu Jia Pi	G002H0402621	62047	40	from supplier
PhytoComm	Wu Jia Pi	G002H0402621	62048	40	from supplier

Validation samples

A total of 36 840 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 *Wu Jia Pi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Wu Jia Pi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Wu Jia Pi	G002H0402621	62047 [†]	20
PhytoComm	Wu Jia Pi	G002H0402621	62048 [†]	20

- 13 503 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Wu Jia Pi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Wu Jia Pi	G002H0402321	2
Phytocomm	Wu Jia Pi	G002H0402321	2
Phytocomm	Wu Jia Pi	g002h0402321	1
PhytoComm	Wu Jia Pi	H0402021	1
Phytocomm	Wu Jia Pi	H042021	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wu Jia Pi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wu Jia Pi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	7	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4415 %)	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
62047	62047	0.00	8.38
62048	62048	0.00	8.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Wu Mei**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60021-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wu Mei; Pruni mume fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Wu Mei	G167H1026421	61673	40	from supplier
PhytoComm	Wu Mei	G167H1026521	61785	40	from supplier
PhytoComm	Wu Mei	G167H1026521	61830	40	from supplier

Validation samples

A total of 36 840 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 *Wu Mei*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Wu Mei*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Wu Mei	G167H1026421	61673 [†]	20
PhytoComm	Wu Mei	G167H1026521	61785 [†]	20
PhytoComm	Wu Mei	G167H1026521	61830 [†]	20

- 13 483 spectra from a total of 316 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.

- 8 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Wu Mei*.

Supplier	Substance	Batch	Spectra
Phytocomm	Wu Mei	G167H1026421	1
PhytoComm	Wu Mei	G167H1026121	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
Phytocomm	Wu Mei	G167H1026121	1
Phytocomm	Wu Mei	G167H1026221	1
phytocomm	Wu Mei	H1026021	2
PhytoComm	Wu Mei	H1026021	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wu Mei* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wu Mei* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	3	2	6	1970

The substance/substance group *Wu Mei* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.8756 % (> 99.5963 %)	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
61673	61673	0.00	19.47
61785	61785	0.00	18.17
61830	61830	0.00	18.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Wu Wei Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60001-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wu Wei Zi; Schisandrae chinensis fructus

Special notes

When selecting the *Wu Wei Zi* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Wu Wei Zi	G220H0401421	61444	40	from supplier
PhytoComm	Wu Wei Zi	G220H0401621	61925	40	from supplier
PhytoComm	Wu Wei Zi	G220H0401621	61926	40	from supplier

Validation samples

A total of 36 840 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 *Wu Wei Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Wu Wei Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Wu Wei Zi	G220H0401421	61152	75
PhytoComm	Wu Wei Zi	G220H0401621	61925 [†]	20
PhytoComm	Wu Wei Zi	G220H0401621	61926 [†]	20

- 13 428 spectra from a total of 316 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.

- 8 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Wu Wei Zi*.

Supplier	Substance	Batch	Spectra
phytoComm	Wu Wei Zi	H0401021	1
Phytocomm	Wu Wei Zi	G220H0401421	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
PhytoComm	Wu Wei Zi	G220H0401122	1
Phytocomm	Wu Wei Zi	H0401021	2
PhytoComm	Wu Wei Zi	H0401021	2

- 1973 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wu Wei Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wu Wei Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	113	2	13 428
Type C	0	2	6	1973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	98.2609 % (> 95.6522 %)
Type C	100.0000 % (> 99.4414 %)	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
61444	61444	0.00	29.41
61925	61925	0.00	45.27
61926	61926	0.00	44.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Wu Zhu Yu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50356-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wu Zhu Yu; Evodiae rutecarpae fructus

Special notes

When selecting the *Wu Zhu Yu* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Wu Zhu Yu	G103H0766522	61773	40	from supplier
PhytoComm	Wu Zhu Yu	G103H0766522	61831	40	from supplier

Validation samples

A total of 36 840 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 *Wu Zhu Yu*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Wu Zhu Yu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Wu Zhu Yu	G103H0766522	61773 [†]	20
PhytoComm	Wu Zhu Yu	G103H0766522	61831 [†]	20

- 13 503 spectra from a total of 317 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.

- 11 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Wu Zhu Yu*.

Supplier	Substance	Batch	Spectra
PhytoComm	Wu Zhu Yu	G103H0766321	2
PhytoComm	Wu Zhu Yu	(G103)H0766321	1
PhytoComm	Wu Zhu Yu	G103H0766021	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
Phytocomm	Wu Zhu Yu	G103H0766021	1
PhytoComm	Wu Zhu Yu	G103H0766022	1
Phytocomm	Wu Zhu Yu	G103H0766022	3
Phytocomm	Wu Zhu Yu	G103H0766321	1
Phytocomm	Wu Zhu Yu	G13H0766021	1

- 1970 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wu Zhu Yu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wu Zhu Yu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	9	40	0	13 494
Type C	8	0	11	1962

The substance/substance group *Wu Zhu Yu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	99.9614 % (> 99.9263 %)	100.0000 % (> 85.0000 %)
Type C	99.4927 % (> 99.2133 %)	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
61773	61773	0.00	7.72
61831	61831	0.00	7.11

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xi Xian Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60103-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xi Xian Cao; Siegesbeckiae herba

Special notes

When selecting the *Xi Xian Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xi Xian Cao	G229H1431521	61903	40	from supplier
PhytoComm	Xi Xian Cao	G229H1431521	61904	40	from supplier

Validation samples

A total of 36 840 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 *Xi Xian Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Xi Xian Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xi Xian Cao	G229H1431521	61903 [†]	20
PhytoComm	Xi Xian Cao	G229H1431521	61904 [†]	20

- 13 503 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 2 batches from the substance/substance group *Xi Xian Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xi Xian Cao	G229H1431321	1
PhytoComm	Xi Xian Cao	G229H1431321	1
phytocomm	Xi Xian Cao	G229H1431121	1
PhytoComm	Xi Xian Cao	G229H1431121	2
Phytocomm	Xi Xian Cao	G229H1431121	4

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

- 1972 spectra from 16 *Apo-Ident* customers from a total of 962 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xi Xian Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xi Xian Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	9	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4413 %)	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
61903	61903	0.00	11.42
61904	61904	0.00	11.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xi Yang Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60422-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xi Yang Shen; Panacis quinquefolii radix

Special notes

When selecting the *Xi Yang Shen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xi Yang Shen	G324HS4070L1	61726	40	from supplier
PhytoComm	Xi Yang Shen	G324HS407PP1	61863	40	from supplier
PhytoComm	Xi Yang Shen	G324HS407PP1	61864	40	from supplier

Validation samples

A total of 36 840 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 *Xi Yang Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Xi Yang Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xi Yang Shen	G324HS4070L1	61726 [†]	20
PhytoComm	Xi Yang Shen	G324HS407PP1	61863 [†]	20
PhytoComm	Xi Yang Shen	G324HS407PP1	61864 [†]	20

- 13 483 spectra from a total of 316 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.

- 6 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Xi Yang Shen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xi Yang Shen	G324HS4070L1	1
Phytocomm	Xi Yang Shen	G324H0647021	2

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
PhytoComm	Xi Yang Shen	G324H0647321	1
Phytocomm	Xi Yang Shen	G324H0647321	1
Phytocomm	Xi Yang Shen	g324h0647321	1

- 1975 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xi Yang Shen* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xi Yang Shen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	1	5	1975

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4417 %)	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
61726	61726	0.00	7.66
61863	61863	0.00	19.08
61864	61864	0.00	19.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xia Ku Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60080-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xia Ku Cao; Prunellae vulgaris spica

Special notes

When selecting the *Xia Ku Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xia Ku Cao	G202H1064421	61006	20	from supplier
PhytoComm	Xia Ku Cao	G202H1064421	61464	40	from supplier
PhytoComm	Xia Ku Cao	G202H1064421	61760	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 100 spectra of 3 reference samples from the substance/substance group *Xia Ku Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 216 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Xia Ku Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xia Ku Cao	G202H1064421	61172	75
PhytoComm	Xia Ku Cao	G202H1064421	61760 [†]	20

- 13 448 spectra from a total of 317 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.

- 10 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Xia Ku Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xia Ku Cao	G202H1064022	1
PhytoComm	Xia Ku Cao	G202H1064121	1
Phytocomm	Xia Ku Cao	G202H1064221	3

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

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Supplier	Substance	Batch	Spectra
Phytocomm	Xia Ku Cao	g202h1064121	1
PhytoComm	Xia Ku Cao	G202H1064221	2
Phytocomm	Xia Ku Cao	H1064922	1
Phytocomm	Xia Ku Cao	G202H1064421	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	100	0	21 216
Type B	0	93	2	13 448
Type C	0	0	10	1971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 94.0000 %)
Type B	100.0000 % (> 99.9295 %)	97.8947 % (> 94.7368 %)
Type C	100.0000 % (> 99.4412 %)	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
61006	61006	0.00	75.15
61464	61464	0.00	79.58
61760	61760	0.00	87.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xian Mao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60316-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xian Mao; Curculiginis orchioideis rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xian Mao	G304H0549621	61887	40	from supplier
PhytoComm	Xian Mao	G304H0549621	61888	40	from supplier
PhytoComm	Xian Mao	G304H0549621	62049	40	from supplier
PhytoComm	Xian Mao	G304H0549621	62050	40	from supplier

Validation samples

A total of 36 840 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 *Xian Mao*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Xian Mao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xian Mao	G304H0549621	61887 [†]	20
PhytoComm	Xian Mao	G304H0549621	61888 [†]	20
PhytoComm	Xian Mao	G304H0549621	62049 [†]	20
PhytoComm	Xian Mao	G304H0549621	62050 [†]	20

- 13 463 spectra from a total of 317 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.

- 7 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Xian Mao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xian Mao	G304H0549521	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*.

continued from previous page

Supplier	Substance	Batch	Spectra
PhytoComm	Xian Mao	G304H0549021	3
Phytocomm	Xian Mao	G304H0549321	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xian Mao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xian Mao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	3	2	5	1971

The substance/substance group *Xian Mao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	99.9411 % (> 99.6619 %)	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
61887	61887	0.00	8.99
61888	61888	0.00	9.44
62049	62049	0.00	8.58
62050	62050	0.00	8.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xiang Fu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60185-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xiang Fu; Cyperi rotundi rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xiang Fu	G088H0930621	62083	40	from supplier
PhytoComm	Xiang Fu	G088H0930621	62084	40	from supplier

Validation samples

A total of 36 840 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 *Xiang Fu*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Xiang Fu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xiang Fu	G088H0930621	62083 [†]	20
PhytoComm	Xiang Fu	G088H0930621	62084 [†]	20

- 13 503 spectra from a total of 317 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.

- 17 spectra from 9 *Apo-Ident* customers from 6 batches from the substance/substance group *Xiang Fu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xiang Fu	G088H0930521	5
PhytoComm	Xiang Fu	G088H0930521	1
Phytocomm	Xiang Fu	G088H0930123	4

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

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Supplier	Substance	Batch	Spectra
PhytoComm	Xiang Fu	G088H0930123	1
Phytocomm	Xiang Fu	g088h0930123	1
PhytoComm	Xiang Fu	G088H0930321	2
Phytocomm	Xiang Fu	go88h09	1
PhytoComm	Xiang Fu	H0930021	1
Phytocomm	Xiang Fu	H0930021	1

- 1964 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xiang Fu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xiang Fu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	1	36	4	13 502
Type C	2	0	17	1962

The substance/substance group *Xiang Fu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	99.9971 % (> 99.9619 %)	90.0000 % (> 82.5000 %)
Type C	99.9689 % (> 99.6893 %)	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
62083	62083	0.00	6.95
62084	62084	0.00	6.64

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xiao Hui Xiang**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60209-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xiao Hui Xiang; Foeniculi vulgaris fructus

Special notes

When selecting the *Xiao Hui Xiang* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xiao Hui Xiang	G104H0339522	61717	40	from supplier
PhytoComm	Xiao Hui Xiang	G104H0339622	61987	40	from supplier
PhytoComm	Xiao Hui Xiang	G104H0339622	61988	40	from supplier

Validation samples

A total of 36 840 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 *Xiao Hui Xiang*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Xiao Hui Xiang*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xiao Hui Xiang	G104H0339522	61717 [†]	20
PhytoComm	Xiao Hui Xiang	G104H0339622	61987 [†]	20
PhytoComm	Xiao Hui Xiang	G104H0339622	61988 [†]	20

- 13 483 spectra from a total of 316 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.

- 7 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Xiao Hui Xiang*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xiao Hui Xiang	g104h0339321	1
Phytocomm	Xiao Hui Xiang	G104H0339522	3

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
PhytoComm	Xiao Hui Xiang	G104H0339321	1
PhytoComm	Xiao Hui Xiang	H0339021	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xiao Hui Xiang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xiao Hui Xiang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	3	3	4	1971

The substance/substance group *Xiao Hui Xiang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.9300 % (> 99.6508 %)	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
61717	61717	0.00	10.95
61987	61987	0.00	8.94
61988	61988	0.00	9.43

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xie Bai**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60362-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xie Bai; Allii bulbus; Allii macrostemonis bulbus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xie Bai	G504H1830422	61674	40	from supplier
PhytoComm	Xie Bai	G504H1830621	62109	40	from supplier
PhytoComm	Xie Bai	G504H1830621	62110	40	from supplier

Validation samples

A total of 36 840 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 *Xie Bai*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Xie Bai*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xie Bai	G504H1830422	61674 [†]	20
PhytoComm	Xie Bai	G504H1830621	62109 [†]	20
PhytoComm	Xie Bai	G504H1830621	62110 [†]	20

- 13 483 spectra from a total of 316 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.

- 4 spectra from 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Xie Bai*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xie Bai	G504H1830421	1
Phytocomm	Xie Bai	G504H1830422	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
PhytoComm	Xie Bai	G504H1830121	1
PhytoComm	Xie Bai	G504H1830321	1

- 1977 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xie Bai* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xie Bai* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	1	2	2	1976

The substance/substance group *Xie Bai* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.9751 % (> 99.6963 %)	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
61674	61674	0.00	9.76
62109	62109	0.00	10.14
62110	62110	0.00	9.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xin Yi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60231-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xin Yi; Magnoliae flos

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xin Yi	G153H0758521	61659	40	from supplier
PhytoComm	Xin Yi	G153H0758523	61981	40	from supplier
PhytoComm	Xin Yi	G153H0758523	61982	40	from supplier

Validation samples

A total of 36 840 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 *Xin Yi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Xin Yi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xin Yi	G153H0758521	61659 [†]	20
PhytoComm	Xin Yi	G153H0758523	61981 [†]	20
PhytoComm	Xin Yi	G153H0758523	61982 [†]	20

- 13 483 spectra from a total of 316 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.

- 10 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Xin Yi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xin Yi	161213xy	1
Phytocomm	Xin Yi	G153H0758521	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
PhytoComm	Xin Yi	G153H0758121	3
Phytocomm	Xin Yi	G153H0758121	3
PhytoComm	Xin Yi	G153H0758321	2

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xin Yi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xin Yi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	3	7	1971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4412 %)	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
61659	61659	0.00	13.98
61981	61981	0.00	16.26
61982	61982	0.00	16.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xu Duan**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60245-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xu Duan; Dipsaci radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xu Duan	G092H2106621	62007	40	from supplier
PhytoComm	Xu Duan	G092H2106621	62008	40	from supplier

Validation samples

A total of 36 840 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 *Xu Duan*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Xu Duan*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xu Duan	G092H2106621	62007 [†]	20
PhytoComm	Xu Duan	G092H2106621	62008 [†]	20

- 13 503 spectra from a total of 317 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.

- 4 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Xu Duan*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xu Duan	G092H2106422	1
PhytoComm	Xu Duan	G092H2106023	2
PhytoComm	Xu Duan	G092H2106321	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*.

- 1977 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xu Duan* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xu Duan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	4	1977

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4424 %)	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
62007	62007	0.00	13.15
62008	62008	0.00	12.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xuan Fu Hua**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60223-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xuan Fu Hua; Inulae flos

Special notes

When selecting the *Xuan Fu Hua* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xuan Fu Hua	G126H1168521	61664	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Xuan Fu Hua*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Xuan Fu Hua*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xuan Fu Hua	G126H1168521	61664 [†]	20

- 13 523 spectra from a total of 317 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.

- 6 spectra from 4 *Apo-Ident* customers from 3 batches from the substance/substance group *Xuan Fu Hua*.

Supplier	Substance	Batch	Spectra
PhytoComm	Xuan Fu Hua	G126H1168521	1
PhytoComm	Xuan Fu Hua	G126H1168121	1
PhytoComm	Xuan Fu Hua	G126H1168121	1
PhytoComm	Xuan Fu Hua	H1168921	2
PhytoComm	Xuan Fu Hua	H1168921	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*.

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	2	1	5	1973

The substance/substance group *Xuan Fu Hua* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.8934 % (> 99.6143 %)	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
61664	61664	0.00	9.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Xuan Shen**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60095-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xuan Shen; Scrophulariae ningpoensis radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Xuan Shen	G223H0537421	61442	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Xuan Shen*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 75 spectra of 1 reference samples from the substance/substance group *Xuan Shen*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Xuan Shen	G223H0537421	61150	75

- 13 468 spectra from a total of 317 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.

- 12 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Xuan Shen*.

Supplier	Substance	Batch	Spectra
Phytocomm	Xuan Shen	G223H0537421	1
PhytoComm	Xuan Shen	G223H0537221	3
Phytocomm	Xuan Shen	G223H0537221	1
PhytoComm	Xuan Shen	G223H0537322	1
Phytocomm	Xuan Shen	g22h0537322	1
Phytocomm	Xuan Shen	H0537021	2
Euro OTC	Xuan Shen	H0537021	1
PhytoComm	Xuan Shen	H0537021	2

- 1969 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	75	0	13 468
Type C	1	6	6	1968

The substance/substance group *Xuan Shen* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.0000 %)
Type C	99.9804 % (> 99.7009 %)	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
61442	61442	0.00	10.03

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yan Hu Suo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60439-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yan Hu Suo; Corydalis rhizoma

Special notes

When selecting the *Yan Hu Suo* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yan Hu Suo	G081H0805622	62039	40	from supplier
PhytoComm	Yan Hu Suo	G081H0805622	62040	40	from supplier

Validation samples

A total of 36 840 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 *Yan Hu Suo*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Yan Hu Suo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yan Hu Suo	G081H0805622	62039 [†]	20
PhytoComm	Yan Hu Suo	G081H0805622	62040 [†]	20

- 13 503 spectra from a total of 317 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.

- 12 spectra from 9 *Apo-Ident* customers from 6 batches from the substance/substance group *Yan Hu Suo*.

Supplier	Substance	Batch	Spectra
PhytoComm	Yan Hu Suo	G081F1000301	3
Phytocomm	Yan Hu Suo	G081F1000301	1
Phytocomm	Yan Hu Suo	g081f1000301	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
PhytoComm	Yan Hu Suo	G081H0805221	1
Phytocomm	Yan Hu Suo	G081H0805221	1
PhytoComm	Yan Hu Suo	G081H0805223	1
Phytocomm	Yan Hu Suo	G081H0805223	1
Phytocomm	Yan Hu Suo	G081H0805521	1
PhytoComm	Yan Hu Suo	G081H0805521	1
PhytoComm	Yan Hu Suo	G081H0805223	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yan Hu Suo* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yan Hu Suo* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	1	0	12	1968

The substance/substance group *Yan Hu Suo* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9781 % (> 99.6986 %)	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
62039	62039	0.00	7.58
62040	62040	0.00	7.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ye Jiao Teng**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60068-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ye Jiao Teng; Polygoni multiflori caulis

Special notes

When selecting the *Ye Jiao Teng* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ye Jiao Teng	G288H0885522	61750	40	from supplier
PhytoComm	Ye Jiao Teng	G288H0885522	62051	40	from supplier
PhytoComm	Ye Jiao Teng	G288H0885522	62052	40	from supplier

Validation samples

A total of 36 840 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 *Ye Jiao Teng*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Ye Jiao Teng*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ye Jiao Teng	G288H0885522	61750 [†]	20
PhytoComm	Ye Jiao Teng	G288H0885522	62051 [†]	20
PhytoComm	Ye Jiao Teng	G288H0885522	62052 [†]	20

- 13 483 spectra from a total of 317 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.

- 9 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Ye Jiao Teng*.

Supplier	Substance	Batch	Spectra
Phytocomm	Ye Jiao Teng	G288H0885223	2
Phytocomm	Ye Jiao Teng	G288H0885522	2

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
PhytoComm	Ye Jiao Teng	G288H0885522	2
Phytocomm	Ye Jiao Teng	g228h0085223	1
PhytoComm	Ye Jiao Teng	H0885021	1
Phytocomm	Ye Jiao Teng	H0885922	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ye Jiao Teng* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ye Jiao Teng* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	4	5	1972

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4413 %)	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
61750	61750	0.00	24.31
62051	62051	0.00	24.25
62052	62052	0.00	24.12

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yi Mu Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60105-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yi Mu Cao; Leonuri heterophylli herba

Special notes

When selecting the *Yi Mu Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yi Mu Cao	G134H1050421	61519	40	from supplier
PhytoComm	Yi Mu Cao	G134H1050521	61671	40	from supplier
PhytoComm	Yi Mu Cao	G134H1050621	61983	40	from supplier
PhytoComm	Yi Mu Cao	G134H1050621	61984	40	from supplier

Validation samples

A total of 36 840 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 *Yi Mu Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 135 spectra of 4 reference samples from the substance/substance group *Yi Mu Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yi Mu Cao	G134H1050421	61228	75
PhytoComm	Yi Mu Cao	G134H1050521	61671 [†]	20
PhytoComm	Yi Mu Cao	G134H1050621	61983 [†]	20
PhytoComm	Yi Mu Cao	G134H1050621	61984 [†]	20

- 13 408 spectra from a total of 315 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 9 *Apo-Ident* customers from 5 batches from the substance/substance group *Yi Mu Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Yi Mu Cao	G134H1050521	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
PhytoComm	Yi Mu Cao	G134H1050521	3
PhytoComm	Yi Mu Cao	G134H1050023	3
Phytocomm	Yi Mu Cao	G134H1050023	1
Phytocomm	Yi Mu Cao	G134H1050024	3
PhytoComm	Yi Mu Cao	G134H1050024	1
Phytocomm	Yi Mu Cao	g134h1050024	1
PhytoComm	Yi Mu Cao	G134H1050321	2

- 1966 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yi Mu Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yi Mu Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	135	0	13 408
Type C	1	3	12	1965

The substance/substance group *Yi Mu Cao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 95.5556 %)
Type C	99.9751 % (> 99.6956 %)	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
61519	61519	0.00	12.05
61671	61671	0.00	21.00
61983	61983	0.00	12.31
61984	61984	0.00	12.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yi Yi Ren**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60174-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yi Yi Ren; Coicis semen

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yi Yi Ren	G078H1701323	60925	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701421	61095	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701323	61559	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701522	61791	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701522	61817	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701522	62067	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701522	62068	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701622	62097	40	from supplier
PhytoComm	Yi Yi Ren	G078H1701622	62098	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Yi Yi Ren*. These samples are listed above in the [calibration samples](#) section.
- 20 956 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 215 spectra of 8 reference samples from the substance/substance group *Yi Yi Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yi Yi Ren	G078H1701421	61095 [†]	20
PhytoComm	Yi Yi Ren	G078H1701323	61268	75
PhytoComm	Yi Yi Ren	G078H1701522	61791 [†]	20
PhytoComm	Yi Yi Ren	G078H1701522	61817 [†]	20
PhytoComm	Yi Yi Ren	G078H1701522	62067 [†]	20
PhytoComm	Yi Yi Ren	G078H1701522	62068 [†]	20
PhytoComm	Yi Yi Ren	G078H1701622	62097 [†]	20
PhytoComm	Yi Yi Ren	G078H1701622	62098 [†]	20

- 13 328 spectra from a total of 314 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*.

- 19 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Yi Yi Ren*.

Supplier	Substance	Batch	Spectra
PhytoComm	Yi Yi Ren	G078H1701522	3
PhytoComm	Yi Yi Ren	G078H1701222	3
PhytoComm	Yi Yi Ren	G078H1701323	1
PhytoComm	Yi Yi Ren	G078H1701323	1
PhytoComm	Yi Yi Ren	g078h1701323	1
PhytoComm	Yi Yi Ren	H1701021	1
PhytoComm	Yi Yi Ren	H1701021	8
PhytoComm	Yi Yi Ren	H1701923	1

- 1962 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yi Yi Ren* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yi Yi Ren* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	20 956
Type B	0	215	0	13 328
Type C	0	10	9	1962

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 97.2093 %)
Type C	100.0000 % (> 99.4408 %)	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
60925	60925	0.00	33.98
61095	61095	0.00	40.07
61559	61559	0.00	37.28
61791	61791	0.00	44.31
61817	61817	0.00	42.95
62067	62067	0.00	42.55
62068	62068	0.00	44.14
62097	62097	0.00	37.48
62098	62098	0.00	37.37

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yin Chen Hao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60163-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yin Chen Hao; Artemisiae scopariae herba

Special notes

When selecting the *Yin Chen Hao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yin Chen Hao	G034H1030421	61688	40	from supplier
PhytoComm	Yin Chen Hao	G034H1030621	61832	40	from supplier

Validation samples

A total of 36 840 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 *Yin Chen Hao*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Yin Chen Hao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yin Chen Hao	G034H1030421	61688 [†]	20
PhytoComm	Yin Chen Hao	G034H1030621	61832 [†]	20

- 13 503 spectra from a total of 316 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.

- 10 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Yin Chen Hao*.

Supplier	Substance	Batch	Spectra
Fagron	Yin Chen Hao	G034H1030421	2
PhytoComm	Yin Chen Hao	G034H1030022	1
Phytocomm	Yin Chen Hao	G034H1030121	3

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
Phytocomm	Yin Chen Hao	G034H1030022	1
PhytoComm	Yin Chen Hao	G034H1030121	1
PhytoComm	Yin Chen Hao	H1030021	1
Phytocomm	Yin Chen Hao	H1030021	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yin Chen Hao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yin Chen Hao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	1	40	0	13 502
Type C	6	2	8	1965

The substance/substance group *Yin Chen Hao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	99.9877 % (> 99.9525 %)	100.0000 % (> 85.0000 %)
Type C	99.6855 % (> 99.4061 %)	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
61688	61688	0.00	6.73
61832	61832	0.00	8.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yin Yang Huo**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60228-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yin Yang Huo; Epimedii herba

Special notes

When selecting the *Yin Yang Huo* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yin Yang Huo	G098H1114422	61388	40	from supplier
PhytoComm	Yin Yang Huo	G098H1114621	61774	40	from supplier
PhytoComm	Yin Yang Huo	G098H1114621	61827	40	from supplier

Validation samples

A total of 36 840 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 *Yin Yang Huo*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Yin Yang Huo*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yin Yang Huo	G098H1114422	61388 [†]	20
PhytoComm	Yin Yang Huo	G098H1114621	61774 [†]	20
PhytoComm	Yin Yang Huo	G098H1114621	61827 [†]	20

- 13 483 spectra from a total of 316 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.

- 10 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Yin Yang Huo*.

Supplier	Substance	Batch	Spectra
phythocom	Yin Yang Huo	G098H1114222	1
Phytocomm	Yin Yang Huo	G098H1114422	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
phytocomm	Yin Yang Huo	FA1114702	1
PhytoComm	Yin Yang Huo	G098H1114121	2
Phytocomm	Yin Yang Huo	G098H1114121	1
PhytoComm	Yin Yang Huo	G098H1114222	1
Phytocomm	Yin Yang Huo	G098H1114222	1
PhytoComm	Yin Yang Huo	H1114923	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yin Yang Huo* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yin Yang Huo* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	2	60	0	13 481
Type C	6	2	8	1965

The substance/substance group *Yin Yang Huo* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	99.9964 % (> 99.9612 %)	100.0000 % (> 90.0000 %)
Type C	99.6269 % (> 99.3475 %)	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
61388	61388	0.00	11.25
61774	61774	0.00	9.17
61827	61827	0.00	7.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yu Jin**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60171-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yu Jin; Curcumae tuber

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yu Jin	G084H2201521	61792	40	from supplier
PhytoComm	Yu Jin	G084H2201521	61823	40	from supplier
PhytoComm	Yu Jin	G084H2201621	62019	40	from supplier
PhytoComm	Yu Jin	G084H2201621	62020	40	from supplier

Validation samples

A total of 36 840 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 *Yu Jin*. These samples are listed above in the [calibration samples](#) section.
- 21 156 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 4 reference samples from the substance/substance group *Yu Jin*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yu Jin	G084H2201521	61792 [†]	20
PhytoComm	Yu Jin	G084H2201521	61823 [†]	20
PhytoComm	Yu Jin	G084H2201621	62019 [†]	20
PhytoComm	Yu Jin	G084H2201621	62020 [†]	20

- 13 463 spectra from a total of 316 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.

- 5 spectra from 4 *Apo-Ident* customers from 4 batches from the substance/substance group *Yu Jin*.

Supplier	Substance	Batch	Spectra
Phytocomm	Yu Jin	422901803	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
PhytoComm	Yu Jin	G084H2201322	1
PhytoComm	Yu Jin	G084H2201221	1
PhytoComm	Yu Jin	H2201021	1
Phytocomm	Yu Jin	H2201021	1

- 1976 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yu Jin* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yu Jin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 156
Type B	0	80	0	13 463
Type C	0	1	4	1976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9295 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.4420 %)	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
61792	61792	0.00	9.41
61823	61823	0.00	9.26
62019	62019	0.00	8.12
62020	62020	0.00	7.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yu Xing Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60606-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yu Xing Cao; Houlttuyniae herba

Special notes

When selecting the *Yu Xing Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yu Xing Cao	G124H1149423	61662	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Yu Xing Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Yu Xing Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yu Xing Cao	G124H1149423	61662 [†]	20

- 13 523 spectra from a total of 317 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.

- 12 spectra from 6 *Apo-Ident* customers from 7 batches from the substance/substance group *Yu Xing Cao*.

Supplier	Substance	Batch	Spectra
Phytocomm	Yu Xing Cao	G124H1149222	1
Phytocomm	Yu Xing Cao	g124h1149222	1
Phytocomm	Yu Xing Cao	G124H1149423	2
Phytocomm	Yu Xing Cao	612yxc	1
Phytocomm	Yu Xing Cao	G124H1149122	5
Phytocomm	Yu Xing Cao	g124h1149122	1
PhytoComm	Yu Xing Cao	H1149821	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*.

- 1969 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	12	1969

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4410 %)	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
61662	61662	0.00	10.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yu Zhu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60056-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yu Zhu; Polygonati odorati rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yu Zhu	G195H0517421	61374	40	from supplier
PhytoComm	Yu Zhu	G195H0517521	61941	40	from supplier
PhytoComm	Yu Zhu	G195H0517521	61942	40	from supplier

Validation samples

A total of 36 840 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 *Yu Zhu*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Yu Zhu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yu Zhu	G195H0517421	61374 [†]	20
PhytoComm	Yu Zhu	G195H0517521	61941 [†]	20
PhytoComm	Yu Zhu	G195H0517521	61942 [†]	20

- 13 483 spectra from a total of 316 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.

- 7 spectra from 6 *Apo-Ident* customers from 4 batches from the substance/substance group *Yu Zhu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Yu Zhu	G195H0517421	2
PhytoComm	Yu Zhu	G195H0517121	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
PhytoComm	Yu Zhu	G195H0517321	1
PhytoComm	Yu Zhu	H0517022	2
Phytocomm	Yu Zhu	H0517022	1

- 1974 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Yu Zhu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Yu Zhu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	59	1	13 483
Type C	8	2	5	1966

The substance/substance group *Yu Zhu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	98.3333 % (> 93.3333 %)
Type C	99.6907 % (> 99.4114 %)	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
61374	61374	0.00	12.22
61941	61941	0.00	7.79
61942	61942	0.00	7.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Yuan Zhi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60100-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Yuan Zhi; Polygalae radix

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Yuan Zhi	G194H1406522	61742	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Yuan Zhi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Yuan Zhi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Yuan Zhi	G194H1406522	61742 [†]	20

- 13 523 spectra from a total of 317 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.

- 8 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Yuan Zhi*.

Supplier	Substance	Batch	Spectra
phythocom	Yuan Zhi	g194h1406222	1
Phytocomm	Yuan Zhi	G194H1406522	2
Phytocomm	Yuan Zhi	421401802	1
Phytocomm	Yuan Zhi	g194h140622	1
Phytocomm	Yuan Zhi	G194H1406222	2
PhytoComm	Yuan Zhi	H1406924	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*.

- 1973 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	2	6	1972

The substance/substance group *Yuan Zhi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9534 % (> 99.6741 %)	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
61742	61742	0.00	8.16

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ze Lan**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60322-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ze Lan; Lycopi lucidi herba

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ze Lan	G268H1606421	61634	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Ze Lan*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Ze Lan*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ze Lan	G268H1606421	61634 [†]	20

- 13 523 spectra from a total of 317 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.

- 9 spectra from 6 *Apo-Ident* customers from 5 batches from the substance/substance group *Ze Lan*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ze Lan	G268H1606021	2
Phytocomm	Ze Lan	G268H1606421	1
PhytoComm	Ze Lan	G268H1606022	2
Phytocomm	Ze Lan	G268H1606022	1
Phytocomm	Ze Lan	g268h1606221	1
PhytoComm	Ze Lan	G268H1606221	1
Phytocomm	Ze Lan	G268H1606221	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*.

- 1972 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	5	1	8	1967

The substance/substance group *Ze Lan* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.7761 % (> 99.4968 %)	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
61634	61634	0.00	9.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Ze Xie**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60165-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ze Xie; Alismatis rhizoma

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Ze Xie	G011H1605422	61611	40	from supplier
PhytoComm	Ze Xie	G011H1605422	61695	40	from supplier
PhytoComm	Ze Xie	G011H1605521	61736	40	from supplier

Validation samples

A total of 36 840 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 *Ze Xie*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Ze Xie*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Ze Xie	G011H1605422	61320	75
PhytoComm	Ze Xie	G011H1605422	61695 [†]	20
PhytoComm	Ze Xie	G011H1605521	61736 [†]	20

- 13 428 spectra from a total of 316 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.

- 13 spectra from 7 *Apo-Ident* customers from 6 batches from the substance/substance group *Ze Xie*.

Supplier	Substance	Batch	Spectra
PhytoComm	Ze Xie	(G011)H1605122	1
Phytocomm	Ze Xie	G011H1605422	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
Phytocomm	Ze Xie	G011H1605521	5
PhytoComm	Ze Xie	G011H1605122	1
Phytocomm	Ze Xie	g011h1605122	1
PhytoComm	Ze Xie	H1605022	3
Phytocomm	Ze Xie	H1605022	1

- 1968 spectra from 16 *Apo-Ident* customers from a total of 958 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ze Xie* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ze Xie* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	1	115	0	13 427
Type C	14	9	4	1954

The substance/substance group *Ze Xie* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	99.9964 % (> 99.9611 %)	100.0000 % (> 94.7826 %)
Type C	98.9799 % (> 98.7004 %)	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
61611	61611	0.00	6.43
61695	61695	0.00	8.59
61736	61736	0.00	5.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhe Bei Mu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50388-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhe Bei Mu; Fritillariae thunbergii bulbus

Special notes

When selecting the *Zhe Bei Mu* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhe Bei Mu	G108H0712422	61353	40	from supplier
PhytoComm	Zhe Bei Mu	G108H0712521	61715	40	from supplier

Validation samples

A total of 36 840 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 *Zhe Bei Mu*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zhe Bei Mu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhe Bei Mu	G108H0712422	61353 [†]	20
PhytoComm	Zhe Bei Mu	G108H0712521	61715 [†]	20

- 13 503 spectra from a total of 316 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.

- 12 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Zhe Bei Mu*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zhe Bei Mu	G108H0712121	7
PhytoComm	Zhe Bei Mu	G108H0712121	2
PhytoComm	Zhe Bei Mu	G108H0712321	2
Phytocomm	Zhe Bei Mu	G108H0712422	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*.

- 1969 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhe Bei Mu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhe Bei Mu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	8	3	9	1961

The substance/substance group *Zhe Bei Mu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.2226 % (> 98.9432 %)	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
61353	61353	0.00	20.21
61715	61715	0.00	22.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhi Gan Cao**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60016-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhi Gan Cao; Glycyrrhizae radix et rhizoma praeparata cum melle

Special notes

When selecting the *Zhi Gan Cao* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhi Gan Cao	G118H0881522	61655	40	from supplier
PhytoComm	Zhi Gan Cao	G118H0881622	61985	40	from supplier
PhytoComm	Zhi Gan Cao	G118H0881622	61986	40	from supplier

Validation samples

A total of 36 840 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 *Zhi Gan Cao*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Zhi Gan Cao*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhi Gan Cao	G118H0881522	61655 [†]	20
PhytoComm	Zhi Gan Cao	G118H0881622	61985 [†]	20
PhytoComm	Zhi Gan Cao	G118H0881622	61986 [†]	20

- 13 483 spectra from a total of 316 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.

- 12 spectra from 7 *Apo-Ident* customers from 5 batches from the substance/substance group *Zhi Gan Cao*.

Supplier	Substance	Batch	Spectra
PhytoComm	Zhi Gan Cao	G118H0881322	2
Phytocomm	Zhi Gan Cao	G118H0881522	4

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
PhytoComm	Zhi Gan Cao	G118H0881122	3
PhytoComm	Zhi Gan Cao	G118H0881221	1
PhytoComm	Zhi Gan Cao	G118H0881221	1
PhytoComm	Zhi Gan Cao	g118h0881322	1

- 1969 spectra from 16 *Apo-Ident* customers from a total of 959 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhi Gan Cao* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhi Gan Cao* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	17	5	7	1952

The substance/substance group *Zhi Gan Cao* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	99.5880 % (> 99.3085 %)	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
61655	61655	0.00	11.56
61985	61985	0.00	8.37
61986	61986	0.00	8.41

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhi Ke**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60158-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhi Ke; Citri aurantii fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhi Ke	G043H0921422	61347	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Zhi Ke*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Zhi Ke*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhi Ke	G043H0921422	61347 [†]	20

- 13 523 spectra from a total of 317 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.

- 6 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Zhi Ke*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zhi Ke	G043H0921422	2
Phytocomm	Zhi Ke	G043H0921221	1
PhytoComm	Zhi Ke	G043H0921221	2
PhytoComm	Zhi Ke	H0921021	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*.

- 1975 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	2	4	1974

The substance/substance group *Zhi Ke* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.8756 % (> 99.5965 %)	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
61347	61347	0.00	13.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhi Mu**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60196-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhi Mu; Anemarrhenae radix; Anemarrhenae rhizoma

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhi Mu	G019HS1530N1	61687	40	from supplier
PhytoComm	Zhi Mu	G019H0824521	62027	40	from supplier
PhytoComm	Zhi Mu	G019H0824521	62028	40	from supplier

Validation samples

A total of 36 840 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 *Zhi Mu*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Zhi Mu*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhi Mu	G019HS1530N1	61687 [†]	20
PhytoComm	Zhi Mu	G019H0824521	62027 [†]	20
PhytoComm	Zhi Mu	G019H0824521	62028 [†]	20

- 13 483 spectra from a total of 316 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.

- 7 spectra from 5 *Apo-Ident* customers from 3 batches from the substance/substance group *Zhi Mu*.

Supplier	Substance	Batch	Spectra
PhytoComm	Zhi Mu	G019H0824221	1
PhytoComm	Zhi Mu	G019H0824321	2

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
PhytoComm	Zhi Mu	H0824922	2
Phytocomm	Zhi Mu	H0824922	2

- 1974 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhi Mu* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhi Mu* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	0	7	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4415 %)	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
61687	61687	0.00	9.85
62027	62027	0.00	11.34
62028	62028	0.00	10.09

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhi Shi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60145-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhi Shi; Aurantii fructus immaturus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhi Shi	G044H0922522	62035	40	from supplier
PhytoComm	Zhi Shi	G044H0922522	62036	40	from supplier

Validation samples

A total of 36 840 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 *Zhi Shi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zhi Shi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhi Shi	G044H0922522	62035 [†]	20
PhytoComm	Zhi Shi	G044H0922522	62036 [†]	20

- 13 503 spectra from a total of 317 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.

- 18 spectra from 9 *Apo-Ident* customers from 8 batches from the substance/substance group *Zhi Shi*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zhi Shi	G044H0922521	3
PhytoComm	Zhi Shi	G044H0922021	2
Phytocomm	Zhi Shi	G044H0922021	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
PhytoComm	Zhi Shi	G044H0922121	1
Phytocomm	Zhi Shi	G044H0922121	1
PhytoComm	Zhi Shi	G044H0922221	1
Phytocomm	Zhi Shi	G044H0922221	2
PhytoComm	Zhi Shi	G044H0922321	2
Phytocomm	Zhi Shi	g044h0922221	1
Phytocomm	Zhi Shi	G044H0922321	2
phytocomm	Zhi Shi	g044h0922321	1
PhytoComm	Zhi Shi	H0922921	1

- 1963 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhi Shi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhi Shi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	5	0	18	1958

The substance/substance group *Zhi Shi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8781 % (> 99.5985 %)	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
62035	62035	0.00	18.48
62036	62036	0.00	19.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhi Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60367-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhi Zi; Gardeniae fructus

Special notes

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

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhi Zi	G110H1137521	61686	40	from supplier
PhytoComm	Zhi Zi	G110H1137523	61995	40	from supplier
PhytoComm	Zhi Zi	G110H1137523	61996	40	from supplier

Validation samples

A total of 36 840 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 *Zhi Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 3 reference samples from the substance/substance group *Zhi Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhi Zi	G110H1137521	61686 [†]	20
PhytoComm	Zhi Zi	G110H1137523	61995 [†]	20
PhytoComm	Zhi Zi	G110H1137523	61996 [†]	20

- 13 483 spectra from a total of 316 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.

- 10 spectra from 10 *Apo-Ident* customers from 3 batches from the substance/substance group *Zhi Zi*.

Supplier	Substance	Batch	Spectra
phythocom	Zhi Zi	g110h1137121	1
Phytocomm	Zhi Zi	G110H1137521	3

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
PhytoComm	Zhi Zi	G110H1137521	1
phytocomm	Zhi Zi	G110H1137121	1
Phytocomm	Zhi Zi	G110H1137121	1
PhytoComm	Zhi Zi	G110H1137121	2
Phytocomm	Zhi Zi	g110h1137121	1

- 1971 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhi Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhi Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	60	0	13 483
Type C	0	4	6	1971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9296 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.4412 %)	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
61686	61686	0.00	15.76
61995	61995	0.00	14.36
61996	61996	0.00	14.67

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhu Ling**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60136-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhu Ling; Polypori umbellati sclerotium

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhu Ling	G199H1509421	61466	40	from supplier
PhytoComm	Zhu Ling	G199H1509521	61790	40	from supplier
PhytoComm	Zhu Ling	G199H1509521	61806	40	from supplier

Validation samples

A total of 36 840 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 *Zhu Ling*. These samples are listed above in the [calibration samples](#) section.
- 21 196 spectra from a total of 313 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 115 spectra of 3 reference samples from the substance/substance group *Zhu Ling*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhu Ling	G199H1509421	61174	75
PhytoComm	Zhu Ling	G199H1509521	61790 [†]	20
PhytoComm	Zhu Ling	G199H1509521	61806 [†]	20

- 13 428 spectra from a total of 316 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.

- 7 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Zhu Ling*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zhu Ling	G199H1509421	2
PhytoComm	Zhu Ling	G199H1509521	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
Mediherb	Zhu Ling		1
phytocomm	Zhu Ling	G199H1509022	1
PhytoComm	Zhu Ling	G199H1509022	2

- 1974 spectra from 15 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhu Ling* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhu Ling* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 196
Type B	0	115	0	13 428
Type C	0	3	4	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.4415 %)	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
61466	61466	0.00	13.76
61790	61790	0.00	14.78
61806	61806	0.00	14.30

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zhu Ru**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60241-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zhu Ru; Bambusae in taeniae caulis

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zhu Ru	G047H0625621	62025	40	from supplier
PhytoComm	Zhu Ru	G047H0625621	62026	40	from supplier

Validation samples

A total of 36 840 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 *Zhu Ru*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zhu Ru*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zhu Ru	G047H0625621	62025 [†]	20
PhytoComm	Zhu Ru	G047H0625621	62026 [†]	20

- 13 503 spectra from a total of 317 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 8 *Apo-Ident* customers from 7 batches from the substance/substance group *Zhu Ru*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zhu Ru	G047H0625422	3
Phytocomm	Zhu Ru		1
PhytoComm	Zhu Ru	G047H0625121	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
Phytocomm	Zhu Ru	G047H0625122	1
PhytoComm	Zhu Ru	G047H0625122	1
PhytoComm	Zhu Ru	G047H0625321	2
Phytocomm	Zhu Ru	G047H0625321	3
Phytocomm	Zhu Ru	g047h0625321	1
phytocomm	Zhu Ru	g047h0625321	1
Phytocomm	Zhu Ru	G047h625321	1

- 1966 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zhu Ru* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zhu Ru* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	3	1	14	1963

The substance/substance group *Zhu Ru* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.8713 % (> 99.5918 %)	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
62025	62025	0.00	7.32
62026	62026	0.00	7.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zi Hua Di Ding**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50376-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zi Hua Di Ding; Viola herba

Special notes

When selecting the *Zi Hua Di Ding* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zi Hua Di Ding	G249H1216621	61901	40	from supplier
PhytoComm	Zi Hua Di Ding	G249H1216621	61902	40	from supplier

Validation samples

A total of 36 840 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 *Zi Hua Di Ding*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zi Hua Di Ding*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zi Hua Di Ding	G249H1216621	61901 [†]	20
PhytoComm	Zi Hua Di Ding	G249H1216621	61902 [†]	20

- 13 503 spectra from a total of 317 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.

- 2 spectra from 2 *Apo-Ident* customers from 1 batches from the substance/substance group *Zi Hua Di Ding*.

Supplier	Substance	Batch	Spectra
PhytoComm	Zi Hua Di Ding	G249H1216121	2

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

- 1979 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zi Hua Di Ding* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zi Hua Di Ding* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	0	2	1977

The substance/substance group *Zi Hua Di Ding* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9322 % (> 99.6544 %)	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
61901	61901	0.00	7.72
61902	61902	0.00	7.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zi Su Ye**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60134-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zi Su Ye; Perillae frutescentis folium

Special notes

When selecting the *Zi Su Ye* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zi Su Ye	G182HS2680P1	61658	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *Zi Su Ye*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *Zi Su Ye*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zi Su Ye	G182HS2680P1	61658 [†]	20

- 13 523 spectra from a total of 317 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.

- 7 spectra from 6 *Apo-Ident* customers from 3 batches from the substance/substance group *Zi Su Ye*.

Supplier	Substance	Batch	Spectra
Phytocomm	Zi Su Ye	G182H1214321	2
PhytoComm	Zi Su Ye	G182HS2680P1	1
PhytoComm	Zi Su Ye	G182H1214021	3
PhytoComm	Zi Su Ye	G182H1214321	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*.

- 1974 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	1	6	1974

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4415 %)	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
61658	61658	0.00	18.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zi Su Zi**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60133-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zi Su Zi; Perillae fructus

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zi Su Zi	G183H1213621	61933	40	from supplier
PhytoComm	Zi Su Zi	G183H1213621	61934	40	from supplier

Validation samples

A total of 36 840 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 *Zi Su Zi*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zi Su Zi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zi Su Zi	G183H1213621	61933 [†]	20
PhytoComm	Zi Su Zi	G183H1213621	61934 [†]	20

- 13 503 spectra from a total of 317 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.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Zi Su Zi*.

Supplier	Substance	Batch	Spectra
PhytoComm	Zi Su Zi	H1213921	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*.

- 1980 spectra from 16 *Apo-Ident* customers from a total of 963 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zi Su Zi* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zi Su Zi* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	0	0	1	1980

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.4487 %)	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
61933	61933	0.00	14.34
61934	61934	0.00	14.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **Zi Wan**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60155-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zi Wan; Asteris tatarici radix

Special notes

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

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	Zi Wan	G038H1215621	62045	40	from supplier
PhytoComm	Zi Wan	G038H1215621	62046	40	from supplier

Validation samples

A total of 36 840 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 *Zi Wan*. These samples are listed above in the [calibration samples](#) section.
- 21 236 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 2 reference samples from the substance/substance group *Zi Wan*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	Zi Wan	G038H1215621	62045 [†]	20
PhytoComm	Zi Wan	G038H1215621	62046 [†]	20

- 13 503 spectra from a total of 317 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.

- 8 spectra from 5 *Apo-Ident* customers from 4 batches from the substance/substance group *Zi Wan*.

Supplier	Substance	Batch	Spectra
phytocomm	Zi Wan	g038h1215022	1
Phytocomm	Zi Wan	G038H1215321	2
Phytocomm	Zi Wan	G038H1215022	1
PhytoComm	Zi Wan	G038H1215022	2
Phytocomm	Zi Wan	H1215021	2

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

- 1973 spectra from 16 *Apo-Ident* customers from a total of 960 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zi Wan* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zi Wan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 236
Type B	0	40	0	13 503
Type C	2	2	6	1971

The substance/substance group *Zi Wan* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9609 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9297 %)	100.0000 % (> 85.0000 %)
Type C	99.9511 % (> 99.6718 %)	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
62045	62045	0.00	10.20
62046	62046	0.00	10.48

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group **(Bai) Dou Kou**
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60177-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(Bai) Dou Kou; Amomi cardamomi fructus; Amomi rotundi fructus

Special notes

When selecting the *(Bai) Dou Kou* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	(Bai) Dou Kou	G016H0508521	61700	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group (*Bai*) *Dou Kou*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group (*Bai*) *Dou Kou*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	(Bai) Dou Kou	G016H0508521	61700 [†]	20

- 13 523 spectra from a total of 317 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.

- 3 spectra from 3 *Apo-Ident* customers from 3 batches from the substance/substance group (*Bai*) *Dou Kou*.

Supplier	Substance	Batch	Spectra
Phytocomm	(Bai) Dou Kou	G016H0508021	1
Phytocomm	(Bai) Dou Kou	G016H0508521	1
Phytocomm	(Bai) Dou Kou	G016H0508521	1

- 1978 spectra from 16 *Apo-Ident* customers from a total of 961 batches from a further 267 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 (*Bai*) *Dou Kou* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with (*Bai*) *Dou Kou* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	1	2	1	1977

The substance/substance group (*Bai*) *Dou Kou* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.9534 % (> 99.6749 %)	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
61700	61700	0.00	11.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group (Huai) Niu Xi
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60148-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(Huai) Niu Xi; Achyranthis bidentatae radix

Special notes

When selecting the (Huai) Niu Xi substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	(Huai) Niu Xi	G003H1905422	61637	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group (*Huai*) *Niu Xi*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group (*Huai*) *Niu Xi*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	(Huai) <i>Niu Xi</i>	G003H1905422	61637 [†]	20

- 13 523 spectra from a total of 317 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 8 *Apo-Ident* customers from 7 batches from the substance/substance group (*Huai*) *Niu Xi*.

Supplier	Substance	Batch	Spectra
Phytocomm	(Huai) <i>Niu Xi</i>	G003H1905222	1
Phytocomm	(Huai) <i>Niu Xi</i>	g003h1905222	1
Phytocomm	(Huai) <i>Niu Xi</i>	G003H1905422	1
Phytocomm	(Huai) <i>Niu Xi</i>	G003H1905122	1
PhytoComm	(Huai) <i>Niu Xi</i>	H1905021	3
PhytoComm	(Huai) <i>Niu Xi</i>	G003H1905122	1
Phytocomm	(Huai) <i>Niu Xi</i>	G003H1905321	2
PhytoComm	(Huai) <i>Niu Xi</i>	G003H1905422	1
PhytoComm	(Huai) <i>Niu Xi</i>	G003H190522	1
PhytoComm	(Huai) <i>Niu Xi</i>	G003H1905222	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*.

- 1966 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	3	4	11	1963

The substance/substance group (*Huai*) *Niu Xi* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	99.8401 % (> 99.5605 %)	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
61637	61637	0.00	11.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group (Ku) Xing Ren
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 50290-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(Ku) Xing Ren; Armeniacae amarum semen

Special notes

When selecting the (Ku) Xing Ren substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	(Ku) Xing Ren	G029H0708622	61838	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 40 spectra of 1 reference samples from the substance/substance group *(Ku) Xing Ren*. These samples are listed above in the [calibration samples](#) section.
- 21 276 spectra from a total of 314 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 20 spectra of 1 reference samples from the substance/substance group *(Ku) Xing Ren*.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	(Ku) Xing Ren	G029H0708622	61838 [†]	20

- 13 523 spectra from a total of 317 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.

- 18 spectra from 8 *Apo-Ident* customers from 8 batches from the substance/substance group *(Ku) Xing Ren*.

Supplier	Substance	Batch	Spectra
PhytoComm	(Ku) Xing Ren	G029H0708125	1
PhytoComm	(Ku) Xing Ren	G029H0708322	1
Phytocomm	(Ku) Xing Ren	161213xr	1
PhytoComm	(Ku) Xing Ren	G029H0708024	1
Phytocomm	(Ku) Xing Ren	G029H0708024	2
PhytoComm	(Ku) Xing Ren	G029H0708122	1
Phytocomm	(Ku) Xing Ren	G029H0708122	4
Phytocomm	(Ku) Xing Ren	g029h0708122	1
Phytocomm	(Ku) Xing Ren	G029H0708125	3

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
Phytocomm	(Ku) Xing Ren	g029h0708322	2
PhytoComm	(Ku) Xing Ren	G029H708125	1

- 1963 spectra from 16 *Apo-Ident* customers from a total of 956 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	40	0	21 276
Type B	0	20	0	13 523
Type C	0	0	18	1963

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9611 %)	100.0000 % (> 85.0000 %)
Type B	100.0000 % (> 99.9300 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.4408 %)	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
61838	61838	0.00	26.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group (Sheng) Di Huang
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60005-2017-07-04
Executing company HiperScan GmbH
Weiskeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(Sheng) Di Huang; Rehmanniae radix; Rehmanniae viridae radix

Special notes

When selecting the (Sheng) Di Huang substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	(Sheng) Di Huang	G211H0532422	61452	40	from supplier
PhytoComm	(Sheng) Di Huang	G211H0532521	61651	40	from supplier
PhytoComm	(Sheng) Di Huang	G211H0532621	61797	40	from supplier
PhytoComm	(Sheng) Di Huang	G211H0532621	61804	40	from supplier
PhytoComm	(Sheng) Di Huang	G211H0532621	61881	40	from supplier
PhytoComm	(Sheng) Di Huang	G211H0532621	61882	40	from supplier

Validation samples

A total of 36 840 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 (Sheng) Di Huang. These samples are listed above in the [calibration samples](#) section.
- 21 076 spectra from a total of 312 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 175 spectra of 6 reference samples from the substance/substance group (Sheng) Di Huang.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	(Sheng) Di Huang	G211H0532422	61160	75
PhytoComm	(Sheng) Di Huang	G211H0532521	61651 [†]	20
PhytoComm	(Sheng) Di Huang	G211H0532621	61797 [†]	20
PhytoComm	(Sheng) Di Huang	G211H0532621	61804 [†]	20
PhytoComm	(Sheng) Di Huang	G211H0532621	61881 [†]	20
PhytoComm	(Sheng) Di Huang	G211H0532621	61882 [†]	20

- 13 368 spectra from a total of 315 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.

- 19 spectra from 8 *Apo-Ident* customers from 7 batches from the substance/substance group (Sheng) Di Huang.

[†]These spectra were recorded from 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
Phytocomm	(Sheng) Di Huang	G211H0532521	4
PhytoComm	(Sheng) Di Huang	G211H0532121	2
	(Sheng) Di Huang	g211h0532323	1
PhytoComm	(Sheng) Di Huang	G211H0532323	1
Phytocomm	(Sheng) Di Huang	G211H0532121	3
phytocomm	(Sheng) Di Huang	G211H0532121	1
Phytocomm	(Sheng) Di Huang	g211h0532121	1
Phytocomm	(Sheng) Di Huang	g211h053221	1
Phytocomm	(Sheng) Di Huang	G211H0532221	4
PhytoComm	(Sheng) Di Huang	G211H0532221	1

- 1962 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group (*Sheng*) *Di Huang* can be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with (*Sheng*) *Di Huang* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	21 076
Type B	0	175	0	13 368
Type C	7	8	11	1955

The substance/substance group (*Sheng*) *Di Huang* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9608 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9294 %)	100.0000 % (> 96.5714 %)
Type C	99.8200 % (> 99.5404 %)	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
61452	61452	0.00	8.51
61651	61651	0.00	7.75
61797	61797	0.00	8.73
61804	61804	0.00	9.45
61881	61881	0.00	10.14
61882	61882	0.00	9.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-04

Validated substance/substance group (Shi) Chang Pu
Substance class TCM - Granulated herbal extracts (PhytoComm)
Report date 04/07/2017
Report number 60426-2017-07-04
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(Shi) Chang Pu; Acori graminei rhizoma; Acori rhizoma

Special notes

When selecting the (Shi) Chang Pu substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation occurs after every change to the chemometric model (also “database”) and does so in two steps:

1. The chemometric model is calculated from the calibration spectra using a PCA algorithm. The calibration spectra originate from the calibration samples of all substances in this class.
2. The generated chemometric model is presented all appropriate spectra for evaluation. In three runs, the reference spectra (*Type A*) are presented spectra from independent (*Type B*) samples and spectra from the (*Type C*) field successively.

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
PhytoComm	(Shi) Chang Pu	G006H0544421	61012	40	from supplier
PhytoComm	(Shi) Chang Pu	G006H0544421	61620	40	from supplier
PhytoComm	(Shi) Chang Pu	G006HS2700N1	61721	40	from supplier
PhytoComm	(Shi) Chang Pu	G006HS270PH1	61851	40	from supplier
PhytoComm	(Shi) Chang Pu	G006HS270PH1	61852	40	from supplier
PhytoComm	(Shi) Chang Pu	G006HS2700N1	62073	40	from supplier
PhytoComm	(Shi) Chang Pu	G006HS2700N1	62074	40	from supplier
PhytoComm	(Shi) Chang Pu	G006H0544622	62107	40	from supplier
PhytoComm	(Shi) Chang Pu	G006H0544622	62108	40	from supplier

Validation samples

A total of 36 840 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group (Shi) Chang Pu. These samples are listed above in the [calibration samples](#) section.
- 20 956 spectra from a total of 311 batches from further 200 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have 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 [†].

- 215 spectra of 8 reference samples from the substance/substance group (Shi) Chang Pu.

Supplier	Substance	Batch	Sample ID	Spectra
PhytoComm	(Shi) Chang Pu	G006H0544421	61329	75
PhytoComm	(Shi) Chang Pu	G006HS2700N1	61721 [†]	20
PhytoComm	(Shi) Chang Pu	G006HS270PH1	61851 [†]	20
PhytoComm	(Shi) Chang Pu	G006HS270PH1	61852 [†]	20
PhytoComm	(Shi) Chang Pu	G006HS2700N1	62073 [†]	20
PhytoComm	(Shi) Chang Pu	G006HS2700N1	62074 [†]	20
PhytoComm	(Shi) Chang Pu	G006H0544622	62107 [†]	20
PhytoComm	(Shi) Chang Pu	G006H0544622	62108 [†]	20

- 13 328 spectra from a total of 314 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*.

- 9 spectra from 5 *Apo-Ident* customers from 7 batches from the substance/substance group (*Shi*) *Chang Pu*.

Supplier	Substance	Batch	Spectra
Phytocomm	(Shi) Chang Pu	G006HS2700N1	1
PhytoComm	(Shi) Chang Pu	G006H0544023	1
Phytocomm	(Shi) Chang Pu	g006h0544023	1
Phytocomm	(Shi) Chang Pu	G006H0544122	3
Phytocomm	(Shi) Chang Pu	G006H0544321	1
Herbasinica	(Shi) Chang Pu	g006h0544321	1
Phytocomm	(Shi) Chang Pu	G006H0544322	1

- 1972 spectra from 16 *Apo-Ident* customers from a total of 957 batches from a further 267 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	1	360	0	20 955
Type B	0	207	8	13 328
Type C	9	2	7	1963

The substance/substance group (*Shi*) *Chang Pu* can be distinguished from other substances with some limitations. (*False-positive* classifications were obtained.) In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	99.9959 % (> 99.9762 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9294 %)	96.2791 % (> 94.8837 %)
Type C	99.5019 % (> 99.2225 %)	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
61012	61012	0.00	12.81
61620	61620	0.00	11.44
61721	61721	0.00	4.37
61851	61851	0.00	5.81
61852	61852	0.00	5.56
62073	62073	0.00	5.80
62074	62074	0.00	5.39
62107	62107	0.00	5.25
62108	62108	0.00	5.51

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

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 6 batches. From these 216 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
PhytoComm	Hua Shi	G238H1332521	56	from supplier
PhytoComm	Hua Shi	G238H1332621	27	from supplier
PhytoComm	Hua Shi	G238H1332621	30	from supplier
PhytoComm	Mu Li (Sheng)	G178H0740621	43	from supplier
PhytoComm	Mu Li (Sheng)	G178HS128PN1	30	from supplier
PhytoComm	Mu Li (Sheng)	G178HS128PN1	30	from supplier

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 160 batches. From these, 268 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
Bios	Lu Hui	424263	3
Herba Natura	Qu Mai	8950	1
Herbasin	Fang Ji	G236H0727123	2
Herbasin	Hua Shi	G238H332121	1
Herbasinica	Yi Zhi Ren	G015H1051321	2
phythocom	She Chuang Zi	G076H1154122	3
phytocomm	Bai Bu	G235H0608021	1
phytocomm	E Bu Shi Cao	G061H1801022	3
phytocomm	E Jiao	G036H0861022	2
phytocomm	Fang Ji	FA0727901	2
phytocomm	Gu Ya	G177H1513021	2
phytocomm	Hai Piao Xiao	G305BP051026	1
phytocomm	Hu Zhang	G197H0851021	2
phytocomm	Huo Xiang	H2005021	5
phytocomm	Lu Jiao Jiao	g323h1158121	1
phytocomm	Lu Rong	G296BP031136	1
phytocomm	Mang Xiao	G160H0627121	1
phytocomm	Mi Meng Hua	G054BP021404	2
phytocomm	Wu Gong	G311H1411021	3
phytocomm	Wu Yao	H1025021	4
phytocomm	Xian He Cao	g008h0547321	1
phytocomm	Ye Ju Hua	G514H1187021	3
Phytocomm	(Bai) Jiang Can	G269H0513321	2
Phytocomm	(Bai) Jiang Can	G269H0513222	3
Phytocomm	(Bai) Jiang Can	g144h1708221	1
Phytocomm	(Bai) Jiang Can	g269h0513222	1
Phytocomm	(Fen) Bi Xie	G29H1251121	1
Phytocomm	(Fen) Bi Xie	G290BP021212	1
Phytocomm	(Fen) Bi Xie	G290H1251121	3
Phytocomm	Bai Bian Dou	g093h0510221	1
Phytocomm	Bai Bian Dou	G093H0510221	1
Phytocomm	Bai Bu	G235H0608321	1
Phytocomm	Bai Bu	H0608921	1
Phytocomm	Bai Bu	G235H0608121	2
Phytocomm	Bai Jie Zi	H0518921	1
Phytocomm	Bing Lang	G027H1825221	2
Phytocomm	Chong Wei Zi	G317BP021046	1
Phytocomm	Chong Wei Zi	g317bp021046	1
Phytocomm	Chuan Bei Mu	G107BP020722A	2
Phytocomm	Chuan Bei Mu	g107f11021	1
Phytocomm	Chuan Bei Mu	g107f110721	2
Phytocomm	Chuan Bei Mu	G107F110721	1
Phytocomm	Chuan Lian Zi	H0306921	1
Phytocomm	Chuan Lian Zi	G157H0306121	4
Phytocomm	Chuan Lian Zi	G157H0306421	3
Phytocomm	Da Fu Pi	G293H0321221	1

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Supplier	Substance	Batch	Spectra
Phytocomm	Da Fu Pi	G293H0321021	1
Phytocomm	Da Fu Pi	G293H0321122	2
Phytocomm	Da Huang	g212h0320023	1
Phytocomm	Da Huang	G212H0320521	3
Phytocomm	Deng Xin Cao	G306F100617	1
Phytocomm	Deng Xin Cao	f100707	1
Phytocomm	Di Yu	G2150604121	1
Phytocomm	Di Yu	G215H0604322	1
Phytocomm	Ding Xiang	G058H0210021	1
Phytocomm	Ding Xiang	H0210921	1
Phytocomm	E Bu Shi Cao	G061H1801122	2
Phytocomm	E Jiao	G036H0861421	2
Phytocomm	E Jiao	g036h0861121	1
Phytocomm	E Jiao	g036h0861221	1
Phytocomm	Fang Ji	G236H0727321	1
Phytocomm	Fang Ji	G236H0727321	1
Phytocomm	Hai Tong Pi	G100H1076221	2
Phytocomm	He Zi	G291H1239021	2
Phytocomm	He Zi	G291H1239221	3
Phytocomm	Hu Zhang	g197h0851321	1
Phytocomm	Hu Zhang	G197H0851321	2
Phytocomm	Hua Shi	G238H1332121	3
Phytocomm	Hua Shi	g238h1332121	1
Phytocomm	Jie Cao	H2111921	1
Phytocomm	Jin Ying Zi	G023H0317921	2
Phytocomm	Jin Ying Zi	G023H0846221	1
Phytocomm	Ju Hong	G310H1623121	2
Phytocomm	Long Gu	g0251706122	1
Phytocomm	Lu Jiao Jiao	G323H1158022	1
Phytocomm	Mu Li (Sheng)	G178H0740221	2
Phytocomm	Pang Da Hai	G529H0960023	2
Phytocomm	Pu Gong Ying	G239H1315321	7
Phytocomm	Qian Shi	G102H0836422	1
Phytocomm	Qing Hao	G031H0810221	2
Phytocomm	Quan Xie	G222F110314	1
Phytocomm	Rou Gui	G069H0617123	2
Phytocomm	Rou Gui	g069h0617123	1
Phytocomm	Rou Gui	G069H0617323	2
Phytocomm	Sang Piao Xiao	G282H421029201	1
Phytocomm	Ting Li Zi	H1340022	1
Phytocomm	Tong Cao	G531H114021	2
Phytocomm	Tong Cao	G531H1141021	1
Phytocomm	Wa Leng Zi	G508F110305	2
Phytocomm	Wang Bu Liu Xing	G281H0456521	1
Phytocomm	Wu Gong	G311H411321	1
Phytocomm	Wu Gong	G311H1411321	1
Phytocomm	Wu Yao	G140H1025521	3
Phytocomm	Wu Yao	g140h1025221	1
Phytocomm	Xian He Cao	G008H0547121	2
Phytocomm	Xian He Cao	G008H0547321	1
Phytocomm	Xue Jie	G322H0631921	1
Phytocomm	Yi Zhi Ren	G015H1051521	1
Phytocomm	Yin Xing Ye	G518H1445021	1
Phytocomm	Zhen Zhu Mu	g155h0979221	1
PhytoComm	(Bai) Jiang Can	G269H0513121	2
PhytoComm	(Bai) Jiang Can	H0513021	3
PhytoComm	(Dai) Zhe Shi	410520701	1
PhytoComm	(Fen) Bi Xie	H1251921	1
PhytoComm	(Fen) Bi Xie	G0290H1251121	1
PhytoComm	Bai Bian Dou	H0510921	1

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Supplier	Substance	Batch	Spectra
PhytoComm	Bai Bu	G235H0608221	1
PhytoComm	Bie Jia	G507H2401321	2
PhytoComm	Bie Jia	G507H2401121	3
PhytoComm	Bing Lang	H1825021	4
PhytoComm	Cao Guo	E241050	1
PhytoComm	Chong Wei Zi	E341046	1
PhytoComm	Chuan Bei Mu	H0711921	1
PhytoComm	Chuan Lian Zi	G157H0305221	1
PhytoComm	Ci Shi	F100628	1
PhytoComm	Da Fu Pi	H0321922	1
PhytoComm	Da Huang	G212H0320023	2
PhytoComm	Da Huang	G212H0320321	3
PhytoComm	Deng Xin Cao	F100707	1
PhytoComm	Ding Xiang	G058h0210021	1
PhytoComm	E Bu Shi Cao	G061H180122	1
PhytoComm	E Jiao	G036H0861121	2
PhytoComm	E Jiao	G036H0861221	3
PhytoComm	Gao Ben	H1809921	2
PhytoComm	Gao Ben	G137H1809221	1
PhytoComm	Geng Mi	414161	1
PhytoComm	Geng Mi	G329H1320121	1
PhytoComm	Gu Ya	H1513921	2
PhytoComm	Gui Ban	G530F110210	2
PhytoComm	Hu Zhang	G197H081021	1
PhytoComm	Hua Shi	G238H133121	1
PhytoComm	Lu Jiao Jiao	G323H1158121	2
PhytoComm	Lu Jiao Jiao	G323H1158321	2
PhytoComm	Ma Chi Xian	G255F110310	3
PhytoComm	Mang Xiao	H0627021	1
PhytoComm	Mao Dong Qing	G319H0411121	1
PhytoComm	Mu Li (Sheng)	H0740922	2
PhytoComm	Pu Gong Ying	H1315923	1
PhytoComm	Qian Shi	G102H0836121	4
PhytoComm	Qian Shi	H0836921	1
PhytoComm	Qing Hao	G031H0810021	2
PhytoComm	Ren Dong Teng	G297H0751222	1
PhytoComm	Ren Dong Teng	H0751922	1
PhytoComm	Ren Dong Teng	(G297)H075122	1
PhytoComm	Rou Dou Kou	G16BP020616	1
PhytoComm	Rou Gui	H0617022	3
PhytoComm	She Chuang Zi	G076H1154021	2
PhytoComm	Shi Jue Ming	H0546021	1
PhytoComm	Ting Li Zi	G135H1340121	1
PhytoComm	Wang Bu Liu Xing	H0456021	2
PhytoComm	Wang Bu Liu Xing	G281H0456221	3
PhytoComm	Wu Yao	G140H1025221	2
PhytoComm	Xian He Cao	H0547021	3
PhytoComm	Ye Ju Hua	(G514)H1187021	1
PhytoComm	Yi Zhi Ren	G015H1051022	2
PhytoComm	Yin Chai Hu	G368H1444221	1
PhytoComm	Yin Xing Ye	H1445921	1
PhytoComm	Yu Li Ren	H0967922	1
PhytoComm	Zhen Zhu Mu	H0979921	1
Sino Phyto	Long Gu	G025H1706122	4

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).

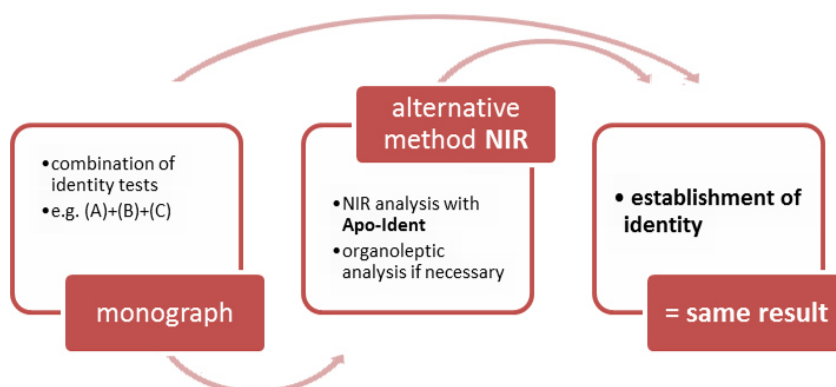


Figure 2: The combination of tests of the monograph is replaced by the alternative method NIR spectroscopy using *Apo-Ident*. This is permissible because both test procedures result in the establishment of the identity of the raw material.

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].

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 2014 einschließlich 1. bis 4. Nachtrag.* 8. Ausgabe. Deutscher Apotheker Verlag (978-3-7692-6508-8)
- [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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