

Validation documentation
APIs & excipients, solid

HiperScan GmbH

April 19, 2017

Contents

Introduction	11
Context of this document	11
Validity scope of this document	12
Validation concept	12
Model creation procedure and validation runs	13
Particularities of individual substance classes	15
Significance of testing with <i>Apo-Ident</i>	16
Conclusion	17
Explanation of terminology	18
Summary	23
Validation samples	23
Validation results	24
Validation reports	25
Acetylcysteine	25
Acetylsalicylic acid	29
Aciclovir	33
Aescin	37
Albendazole	41
Alfatradiol	45
Allantoin	51
Allopurinol	57
alpha-tocopheryl acetate dry concentrate	61
Ambroxol hydrochloride	65
Amiloride hydrochloride	69
Amphotericin B	73
Arginine	77
Arginine hydrochloride	81
Ascorbic acid	85
Ascorbyl palmitate	89
Atropine sulfate	93
Bacitracin	97
Beclometasone dipropionate, anhydrous	101
Benzocaine	105
Benzoic acid	111
Benzydamine hydrochloride	115
Betaine hydrochloride	119
Betaine monohydrate	123
Betamethasone dipropionate, micronized	127
Betamethasone valerate	133
Betamethasone, micronized	143
Bifonazole	147
Biotin	151
Bismuth gallath, basic	155
Boric acid	161
Budesonide, micronized	165
Butylated hydroxytoluene	171
Caffeine	175
Caffeine citrate	179
Calcium ascorbate	183
Calcium citrate tetrahydrate	187
Calcium gluconate	193
Calcium glycerophosphate	197
Calcium lactate pentahydrate	201

Calcium orotate dihydrate	205
Calcium pantothenate	209
Camphor	213
Capsaicin, natural	219
Captopril	223
Carbomer 35000 / 50000	227
Carmellose sodium (400/450/500/600/1600 mPa · s)	233
Cellulose, microcrystalline	237
Cetostearyl alcohol	241
Chloral hydrate	249
Chloramphenicol	255
Chlorhexidine diacetate	263
Chlorhexidine dihydrochloride	269
Chlorocresol	273
Chlortetracycline hydrochloride	277
Cholecalciferol dry concentrate	281
Cholesterol	285
Choline chloride	289
Choline hydrogen tartrate	293
Ciclopirox olamine	297
Ciclosporin	303
Cinchocaine hydrochloride	307
Cinnarizine	311
Ciprofloxacin hydrochloride	315
Citric acid monohydrate	319
Citric acid, anhydrous	323
Citrulline	335
Clindamycin hydrochloride	339
Clindamycin-2-dihydrogen phosphate	345
Clioquinol	349
Clobetasol propionate	357
Clonidine hydrochloride	365
Clotrimazole	369
Colistin sulfate	379
Colophony	383
Cyanocobalamin	387
Cyproterone acetate	391
Cysteine hydrochloride monohydrate	395
Cystine	399
Dapsone	403
Deoxycholic acid	407
Dequalinium chloride	411
Dexamethasone	417
Dexamethasone acetate	423
Dextromethorphan hydrobromide monohydrate	427
D-galactose	431
Diclofenac sodium	435
Diltiazem hydrochloride	441
Dimethyl fumarate	449
Diphenhydramine hydrochloride	453
Diphenylcyclopropanone	457
Doxycycline hyclate	461
Doxylamine hydrogen succinate	465
Drofenine hydrochloride	469
Econazole nitrate	473
Eosin yellowish	477
Ephedrine hydrochloride	481

Epinephrine hydrogen tartrate	485
Ergotamine tartrate	489
Erythromycin	493
Estradiol benzoate	505
Estradiol hemihydrate	511
Estradiol valerate	517
Estriol	523
Ethacridine lactate monohydrate	529
Ethinyl estradiol	533
Ethyl hydrogen fumarate	537
Ethyl hydrogen fumarate calcium	541
Ethyl hydrogen fumarate magnesium	545
Fampridine	549
Finasteride (form III)	553
Fluconazole	557
Fluocinolonacetonid, micronized	561
Folic acid	565
Fructose	569
Furosemide	575
Fusidic acid	579
Gelatine, white	583
Gentamicin sulfate	587
Glucose monohydrate	595
Glucose, anhydrous	603
Glutamic acid	609
Glycine	613
Gramicidin	617
Griseofulvin	621
Guaifenesin	625
Hard fat (601)	629
Heparin sodium	633
Histamine dihydrochloride	637
Hyaluronic acid sodium salt	641
Hydrochlorothiazide	645
Hydrocortisone	649
Hydrocortisone acetate	659
Hydrocortisone butyrate	667
Hydroquinone	671
Hydroxyethylcelluloses (300 / 9000 mPa · s)	675
Hydroxypropyl cellulose (300 mPa · s)	683
Hyoscine butylbromide	687
Hyoscine hydrobromide	691
Ibuprofen	695
Indigo carmine I	699
Indomethacin	703
Inositol	707
Iodoform	711
Ipratropium bromide	715
Isosorbide dinitrate 40%	719
Isoxuprine hydrochloride	725
Ketamine hydrochloride	729
Ketoconazole	733
Ketoprofen	737
Lactose monohydrate	741
Levocarnitine	749
Levothyroxine sodium	753
L-glutathione	757

Lidocaine	761
Lidocaine hydrochloride	767
L-isoleucine	775
Lithium orotate monohydrate	779
L-leucine	783
L-malic acid	787
L-phenylalanine	791
L-proline	795
L-serine	799
L-threonine	803
L-tryptophan	807
Lysine hydrochloride	811
Macrogol 1500	815
Macrogol 4000/6000	819
Magnesium (hydrogen) citrate	827
Magnesium aspartate dihydrate	835
Magnesium citrate, anhydrous	839
Magnesium hydrogen aspartate tetrahydrate	843
Magnesium orotate dihydrate	847
Magnesium stearate	851
Maltodextrin	855
Manganese orotate dihydrate	859
Mannitole	863
Melatonin	871
Menthol	877
Mepivacaine hydrochloride	885
Mesalazine	889
Metamizol sodium monohydrate	893
Methacholine chloride	897
Methionine	901
Methoxsalen	905
Methyl cellulose	909
Methyl-4-hydroxybenzoate	915
Methylcobalamin	921
Methylprednisolone	925
Methylrosanilinium chloride	929
Metoclopramide hydrochloride	933
Metoprolol tartrate	937
Metronidazole	941
Miconazole nitrate	951
Minoxidil	959
Mometasone furoate, micronized	967
Monostereates	975
Mupirocin calcium	981
Naloxone hydrochloride dihydrate	985
Naphazoline hydrochloride	989
Naphazoline nitrate	993
Naproxen	997
Neomycin sulfate	1001
Neostigmine bromide	1007
Nicotinamide	1011
Nicotinic acid	1015
Nitrofurantoin	1019
Non-ionic emulsifying alcohol	1023
Norethisterone acetate	1027
Octenidine dihydrochloride	1031
Ofloxacin	1035

Omeprazole	1039
Ornithine aspartate	1043
Ornithine hydrochloride	1047
Oxalic acid	1051
Oxybuprocaine hydrochloride	1055
Oxybutynin hydrochloride	1059
Oxytetracycline hydrochloride	1063
Pancreas powder	1069
Papaverine hydrochloride	1073
Paracetamol	1077
Patent blue V, E131	1081
Phenazone	1085
Pheniramine maleate	1089
Phenylbutazon	1093
Phenylephrine hydrochloride	1097
Phenytoin	1101
Pilocarpine hydrochloride	1105
Poloxamer 407	1109
Polymyxin B sulfate	1113
Potassium citrate	1117
Potassium hydrogen tartrate	1123
Potassium orotate	1127
Potassium sodium tartrate tetrahydrate	1131
Potassium sorbate	1135
Potassium tartrate hemihydrate	1141
Povidone 25, soluble	1145
Povidone iodine	1149
Prasterone	1153
Prednicarbate, micronized	1157
Prednisolon dihydrogen phosphate dinatrium	1163
Prednisolone acetate	1167
Prednisolone hydrogen succinate	1175
Prednisolone, micronized	1179
Prednisone	1187
Pregnenolone	1191
Prilocaine hydrochloride	1195
Procaine hydrochloride	1199
Progesterone, micronized	1203
Promethazine hydrochloride	1211
Propranolol hydrochloride	1215
Propyl-4-hydroxybenzoate	1221
Propyphenazone	1225
Pyridoxal-5-phosphate	1229
Pyridoxine hydrochloride	1233
Quinidine sulfate dihydrate	1237
Quinine hydrochloride	1241
Quinine sulfate dihydrate	1245
Quinoline sulfates	1249
Quinoline yellow	1253
Resocriol	1257
Ribavirin	1261
Riboflavin	1265
Riboflavin phosphate sodium	1269
Rutoside trihydrate	1273
Saccharin sodium	1277
Salbutamol sulfate	1281
Salicylic acid	1285

Selenium yeast	.1295
Sildenafil citrate	.1299
Sodium acetate trihydrate	.1303
Sodium alginate	.1307
Sodium ascorbate	.1311
Sodium benzoate	.1315
Sodium citrate	.1321
Sodium cromoglicate	.1329
Sodium cyclamate	.1333
Sodium edetate	.1337
Sodium methyl-4-hydroxybenzoate	.1343
Sodium molybdate dihydrate	.1347
Sodium salicylate, powdered	.1351
Sodium tetraborate	.1355
Sorbic acid	.1359
Sorbitol	.1363
Soy lecithin (instant form)	.1369
Spirolactone	.1373
Spray-dried arabic gum	.1379
Starch	.1383
Stearic acid 50	.1389
Sucrose	.1393
Sulfacetamide	.1399
Sulfadiazine	.1403
Sulfogaiacol hydrate	.1407
SyrSpend® SF / pH4	.1411
Tannin	.1415
Tartaric acid	.1421
Taurine	.1427
Testosterone	.1431
Testosterone propionate	.1437
Tetracaine base	.1443
Tetracaine hydrochloride	.1447
Tetracycline hydrochloride	.1455
Thalidomide	.1461
Theophylline	.1465
Theophylline-ethylenediamine hydrate	.1469
Thiamine chloride hydrochloride	.1473
Thymol	.1477
Tobramycin sulfate	.1481
Tosylchloramide sodium	.1485
Tranexamic acid	.1489
Tretinoin	.1493
Triamcinolon, micronized	.1499
Triamcinolone acetonide	.1503
Triclosan	.1515
Trometamol	.1527
Tropicamide	.1533
Tyrosine	.1537
Tyrothricin	.1541
Ubidecarenone	.1545
Urea	.1549
Uridine	.1559
Valine	.1563
Vancomycin hydrochloride	.1567
Vanillin	.1571
Waxes / Fats	.1575

Wool alcohols	1589
Xylitol	1593
Xylometazoline hydrochloride	1597
Xylose	1601
Zinc acetate dihydrate	1605
Zinc gluconate	1609
(R,S)-epinephrine hydrochloride	1613
3,4-diaminopyridine	1617
5-aminolevulinic acid hydrochloride	1621
5-fluorouracil	1625
Appendix	1629
Additional calibration samples (<i>Type A</i>)	1629
Additional validation samples (<i>Type B</i>)	1633
Additional validation samples (<i>Type C</i>)	1647
Requirements of validation	1775
Conformity of <i>Apo-Ident</i> with the <i>European pharmacopeia</i>	1776
References	1777
Index	1779

Introduction

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

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

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

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

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

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

Context of this document

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

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

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

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

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

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

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

Validity scope of this document

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

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

The results are summarised for each substance and reproduced in this document.

- The 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 *APIs & excipients, solid* in the respective validation reports; otherwise in attachments *A*, *B* and *C*.

Furthermore remains valid: validation spectra may only be removed if a 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 $\mathbf{X}$.

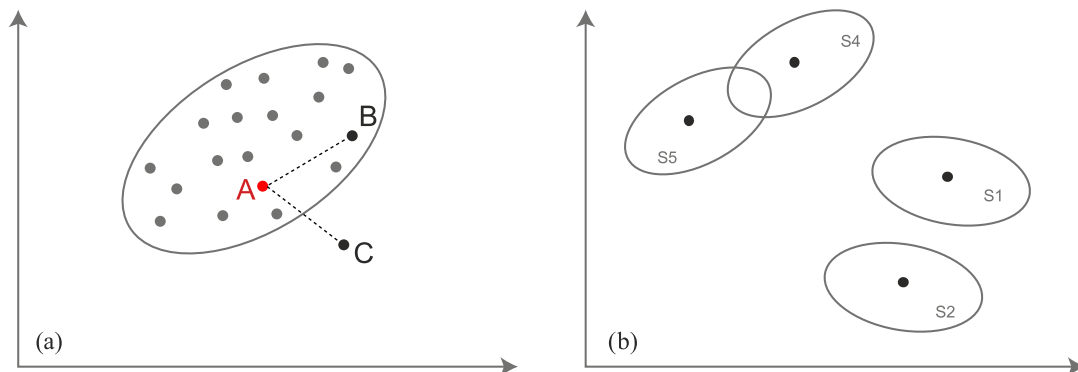


Figure 1: (a) The *Mahalanobis distance* from *A* to *B* is less than from *A* to *C*. However, the Euclidean distances are identical. (b) The *Mahalanobis distance* between the two measurement series *S4* and *S5* is smaller than between *S1* and *S2*. However, the Euclidean distances are identical.

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 213 227 spectra from 23 046 different batches for a total of 821 substances were used to validate the substance class *APIs & excipients, solid*.

Validation samples

The validation samples can be categorised as follows:

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

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	357	1499	70 139
Narcotic substances, solid	18	63	5140
Specific classifier 26188	9	14	599

From category *A* a total of 75 878 spectra from 1576 batches for a total of 384 substances were taken into account for validation.

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

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	470	1484	58 098
Narcotic substances, solid	18	79	3100
Specific classifier 26188	9	15	600
Drugs	124	411	19 550

From category *B* a total of 81 348 spectra from 1989 batches for a total of 621 substances were taken into account for validation.

Type C Spectra from independent samples which are not included in database generation. *Apo-Ident* customers carried out the measurements. Detailed information regarding the batches or samples can be found in the following validation reports in the section *Type C* or in [Appendix C](#).

Substance class	Substances	Batches	Spectra
APIs & excipients, solid	382	14 613	40 103
Specific classifier 26188	5	33	39
Narcotic substances, solid	11	219	376
Drugs	286	6246	15 483

From category *C* a total of 56 001 spectra from 21 111 batches for a total of 684 substances were taken into account for validation.

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	70 044	95	25 348 991
Type B	0	44 950	4737	27 201 544
Type C	0	35 690	1885	18 722 727

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

	Specificity	Recognition rate
Type A	100.000 00 % (> 99.999 97 %)	99.878 29 % (> 99.872 39 %)
Type B	100.000 00 % (> 99.999 96 %)	91.865 44 % (> 91.853 53 %)
Type C	100.000 00 % (> 99.999 59 %)	93.068 62 % (> 92.941 91 %)

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

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower 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 1.3-2017-02

Validated substance/substance group **Acetylcysteine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20040-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Acetylcysteine; Acetylcysteinum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Acetylcysteine*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 6 reference samples from the substance/substance group *Acetylcysteine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Acetylcysteine	8G23-N06	20040	30
Caelo	Acetylcysteine	8309805	20176	40
Euro OTC	Acetylcysteine	1208026-01	21628 [†]	20
Euro OTC	Acetylcysteine	1510016	22228 [†]	20
Caelo	Acetylcysteine	161398	22469 [†]	20
Caelo	Acetylcysteine	163340	23035	40

- 81 178 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 12 spectra from 10 *Apo-Ident* customers from 12 batches from the substance/substance group *Acetylcysteine*.

Supplier	Substance	Batch	Spectra
Euro OTC	Acetylcysteine	12299010	1
Phönix	Acetylcysteine	1208026	1
Phoenix goettin	Acetylcysteine	1208026-01	1
Caelo	Acetylcysteine	10230708	1
Caelo	Acetylcysteine	15114013	1
Caelo	Acetylcysteine	12299021	1
Euro OTC	Acetylcysteine	1307026-02	1
Euro OTC	Acetylcysteine	1408004	1
Caelo	Acetylcysteine	12299002	1
Caelo	Acetylcysteine	10230713	1
Fagron	Acetylcysteine	13A22N07	1
Caelo	Acetylcysteine	12299004	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	164	6	81 178
Type C	0	12	0	55 989

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	96.4706 % (> 94.7059 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21315	22469	8.29	85.45
21628	22469	4.66	80.56
22228	22228	0.00	84.88
22469	22469	0.00	79.31
22854	22854	0.00	86.32
22886	22469	7.82	86.18

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Acetylsalicylic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20449-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Acetylsalicylic acid; Acidum acetylosalicylicum; Acidum acetylsalicylicum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Acetylsalicylic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 240 spectra of 7 reference samples from the substance/substance group *Acetylsalicylic acid*.

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

- 81 108 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 69 spectra from 43 *Apo-Ident* customers from 38 batches from the substance/substance group *Acetylsalicylic acid*.

Supplier	Substance	Batch	Spectra
Euro OTC	Acetylsalicylic acid	815A-01012	1
Caelo	Acetylsalicylic acid	12212223	4
Euro OTC	Acetylsalicylic acid	1307024-01	7
Caelo	Acetylsalicylic acid	13297511	1
Caelo	Acetylsalicylic acid	13324109	1
Phönix	Acetylsalicylic acid	13324114	1
Caelo	Acetylsalicylic acid	13324116	1
Euro OTC	Acetylsalicylic acid	1407025-01	8
Fagron	Acetylsalicylic acid	14B10-B02-296841	1
Caelo	Acetylsalicylic acid	14250101	1
Euro OTC	Acetylsalicylic acid	1501046-01	2
Caelo	Acetylsalicylic acid	14189603	1
Caelo	Acetylsalicylic acid	15081304	1
Caelo	Acetylsalicylic acid	15122701	1
Caelo	Acetylsalicylic acid	15334907	3
Caelo	Acetylsalicylic acid	15334902	1
Caelo	Acetylsalicylic acid	15334914	1
Gehe	Acetylsalicylic acid	10365302	1
Noweda	Acetylsalicylic acid	10040403	1
Euro OTC	Acetylsalicylic acid	1107007-01	3
Caelo	Acetylsalicylic acid	11239703	1
Euro OTC	Acetylsalicylic acid	1212005-01	2
Caelo	Acetylsalicylic acid	1212005-01	1
Caelo	Acetylsalicylic acid	11257126	1
Bombastus	Acetylsalicylic acid	1212005-01	1
Phönix	Acetylsalicylic acid	12145402	1
Caelo	Acetylsalicylic acid	12212203	1
Caelo	Acetylsalicylic acid	12212219	1
Caelo	Acetylsalicylic acid	12212233	1
Caelo	Acetylsalicylic acid	12212230	1
Caelo	Acetylsalicylic acid	12212234	2
Caelo	Acetylsalicylic acid	12212236	3
Sanacorp	Acetylsalicylic acid	1307024-01	1
Phoenix	Acetylsalicylic acid	13324107	1
Sanacorp	Acetylsalicylic acid	13324109	1
Caelo	Acetylsalicylic acid	13324118	2
Euro OTC	Acetylsalicylic acid	20030611-1	1
Caelo	Acetylsalicylic acid	13324119	1
Caelo	Acetylsalicylic acid	3512N-01012	1
Noweda	Acetylsalicylic acid	3946120	1
Caelo	Acetylsalicylic acid	15081308	1
Euro OTC	Acetylsalicylic acid	1011015-01	1
Noweda	Acetylsalicylic acid	1107007-01	1

- 55 932 spectra from 335 *Apo-Ident* customers from a total of 20 574 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	240	0	81 108
Type C	0	69	0	55 932

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 91.3043 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21383	23064	7.95	45.23
21597	23064	9.35	44.28
21637	22820	11.31	50.32
22377	22377	0.00	52.54
22820	22820	0.00	51.82
23064	23064	0.00	49.87

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Aciclovir**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21677-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Aciclovir; Aciclovirum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Aciclovir*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

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

- 81 195 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Aciclovir*.

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

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	153	0	81 195
Type C	0	0	0	56 001

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.0784 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21677	21677	0.00	39.09
21761	21677	5.83	41.57
21831	21677	12.77	47.02

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Aescin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20377-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Aescin; Aescinum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Aescin	1011033-02	20377	30	AR-12-FG-007427-01
Euro OTC	Aescin	1011033	20464	40	AR-13-FG-002538-01
Fagron	Aescin	12K22-N13	21237	30	20121127
Euro OTC	Aescin	1310020-01	21238	20	AR-15-FG-005777-01
Euro OTC	Aescin	1506038	21838	40	0000010480
Fagron	Aescin	12I07-B40-306607	22610	40	1610369
Euro OTC	Aescin	1605021	22684	40	20160609*
Euro OTC	Aescin	1612012	22988	40	20170213*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 8 reference samples from the substance/substance group *Aescin*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Aescin*.

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

- 81 248 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

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

Supplier	Substance	Batch	Spectra
Euro OTC	Aescin	1310020-01	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	85	15	81 248
Type C	0	0	1	56 000

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	85.0000 % (> 82.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20377	20377	0.00	21.29
20464	20464	0.00	15.43
21237	21238	9.94	26.52
21238	21238	0.00	19.43
21838	21838	0.00	32.14
22610	22610	0.00	29.28
22684	22684	0.00	28.16
22988	22988	0.00	23.47

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Albendazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21596-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Albendazole; Albendazolum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Albendazole*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 80 spectra of 3 reference samples from the substance/substance group *Albendazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Albendazole	12J25-B40-293217	21596 [†]	20
Fagron	Albendazole	14B05-B41-299704	21730 [†]	20
Fagron	Albendazole	14B05-B41-314321	22940	40

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Albendazole*.

Supplier	Substance	Batch	Spectra
Fagron	Albendazole	14B05B41-312959	1
Fagron	Albendazole	14B05-B41	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	0	81 268
Type C	0	2	0	55 999

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21596	21596	0.00	49.53
21730	21596	13.20	52.34
22968	21596	12.21	50.65

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Alfatradiol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20292-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Alfatradiol; 17-alpha-Estradiolum; Alfatriadiolum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Alfatradiol	11061005	20292	40	20110406
Fagron	Alfatradiol	13G19-N06	20940	40	1402683
Caelo	Alfatradiol	13201601	21476	80	20130812
Caelo	Alfatradiol	13201601	21477	40	20130812
Euro OTC	Alfatradiol	1404001-01	21714	40	1509288
Euro OTC	Alfatradiol	1603019	22511	40	20160419*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Alfatradiol	15J27-B08-323877	22934	40	20151117
Caelo	Alfatradiol	13201601	21477SI	40	20130812
Euro OTC	Alfatradiol	1404001-01	21714SI	40	1509288
Euro OTC	Alfatradiol	1603019	22511SI	40	20160419*
Fagron	Alfatradiol	15J27-B08-323877	22934SI	40	20151117

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 480 spectra of 11 reference samples from the substance/substance group *Alfatradiol*. These samples are listed above in the [calibration samples](#) section.
- 75 398 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 350 spectra of 11 reference samples from the substance/substance group *Alfatradiol*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Alfatradiol	11B07-N05	20194	40
Fagron	Alfatradiol	11G22-N11	20545	40
Caelo	Alfatradiol	13201601	21476 [†]	40
Caelo	Alfatradiol	13201601	21477 [†]	20
Euro OTC	Alfatradiol	1404001-01	21714 [†]	10
Fagron	Alfatradiol	15J27-B08-323877	22933	40
Audor Pharma	Alfatradiol	AP33-16-I-62P2985A	22935	40
Caelo	Alfatradiol	13201601	21477SI [†]	20
Euro OTC	Alfatradiol	1404001-01	21714SI [†]	20
Fagron	Alfatradiol	15J27-B08-323877	22933SI	40
Audor Pharma	Alfatradiol	AP33-16-I-62P2985A	22935SI	40

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

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

- 80 998 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 194 spectra from 85 *Apo-Ident* customers from 79 batches from the substance/substance group *Alfatradiol*.

Supplier	Substance	Batch	Spectra
Caelo	Alfatradiol	13130805	5
Audor Pharma	Alfatradiol	APXPC0071A	3
Fagron	Alfatradiol	12H29-N05	4
Fagron	Alfatradiol	12L19-N08	8
Audor Pharma	Alfatradiol	APXP103DAA	2
Fagron	Alfatradiol	13G19-N06	19
Caelo	Alfatradiol	13201605	7
Caelo	Alfatradiol	2061504	1
Caelo	Alfatradiol	5051406	1
Fagron	Alfatradiol	12J27-B08-314546	1
Sanacorp	Alfatradiol	13201605	1
Fagron	Alfatradiol	13201605	1
Fagron	Alfatradiol	13L30-B32	2
Fagron	Alfatradiol		1
Fagron	Alfatradiol	13L30B32	1
Fagron	Alfatradiol	13L30-B32-290739	1
Fagron	Alfatradiol	13130b32290742	1
Fagron	Alfatradiol	13L30-B32-290742	1
Caelo	Alfatradiol	14037904	3
Caelo	Alfatradiol	14130104	1
Caelo	Alfatradiol	14139102	2
Caelo	Alfatradiol	14139103	4
Caelo	Alfatradiol	14139104	7
Caelo	Alfatradiol	14139105	1
Fagron	Alfatradiol	14722-B30-302018	1
Caelo	Alfatradiol	14318502	1
Caelo	Alfatradiol	14C20-B02-294943	2
Caelo	Alfatradiol	14C20-B02-294944	1
Fagron	Alfatradiol	14C20-B02-294944	1
Fagron	Alfatradiol	14G07-B99	1
Fagron	Alfatradiol	14G07-B99-294945	4
Fagron	Alfatradiol	14G07-B99-294942	1
Fagron	Alfatradiol	14I22-B30-302017	1
Caelo	Alfatradiol	14I22-B30-302019	1
Caelo	Alfatradiol	15356801	4
Phönix	Alfatradiol	15356801	1
Caelo	Alfatradiol	15380001	5
Fagron	Alfatradiol	15G07-B01-310227	2
Fagron	Alfatradiol	15G07-B01-310228	1
Fagron	Alfatradiol	15G07-B01-310229	2
Fagron	Alfatradiol	15j27-B08-314546	1
Fagron	Alfatradiol	15J27-B08	1
Caelo	Alfatradiol	15G07-B01-311881	1
Shandong northwest manu...	Alfatradiol	AEC151211	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Shandong Northwest Manu...	Alfatradiol	AEC160522	1
Fagron	Alfatradiol	15G07-B01-311881	1
Audor Pharma	Alfatradiol	AP1404001-01A	1
Audor Pharma	Alfatradiol	AP1504015-01A	3
Phönix	Alfatradiol	APXPC0071A	1
Audor Pharma	Alfatradiol	APXPC0071	1
Audor Pharma	Alfatradiol	AP5100461A	2
Audor Pharma	Alfatradiol	AP5104925A	4
Audor Pharma	Alfatradiol	AP514925A	1
Caelo	Alfatradiol	511211	1
Caelo	Alfatradiol	10319909	1
Caelo	Alfatradiol	10319904	1
Caelo	Alfatradiol	11061001	2
Caelo	Alfatradiol	11161805	6
Caelo	Alfatradiol	111161607	1
carlo	Alfatradiol	10319903	1
Caelo	Alfatradiol	11161807	4
Fagron	Alfatradiol	11B07-N05	1
Fagron	Alfatradiol	11D07-N19	1
Fagron	Alfatradiol	11K25-N01	3
Fagron	Alfatradiol	11G22-N11	3
Fagron	Alfatradiol	11k25-N01	1
Caelo	Alfatradiol	12164201	5
Großhandel	Alfatradiol	12164201	1
Caelo	Alfatradiol	12164207	8
Caesar&Loretz GmbH/Anzag	Alfatradiol	12164207	1
Noweda	Alfatradiol	12D19-N03	2
Euro OTC	Alfatradiol	121696	1
Fagron	Alfatradiol	12D19-N03	6
Phoenix	Alfatradiol	12D19-N03	1
Caelo	Alfatradiol	12H29N05	1
Fagron	Alfatradiol	12L10-N08	1
Hirsch	Alfatradiol	12L19-N08	2
Fagron	Alfatradiol	12L19-No8	1
Caelo	Alfatradiol	13130806	2
Caelo	Alfatradiol	13130808	1
Fagron	Alfatradiol	13G19-N06	1
Fagron	Alfatradiol	13G19-No6	1
Fagron	Alfatradiol	13L30B32-290741	1
Audor Pharma	Alfatradiol	AP9374-2/10A	1
Audor Pharma	Alfatradiol	AP9374-3/11A	1
Audor Pharma	Alfatradiol	ap9374311a	1
Fagron	Alfatradiol	XP101UT	1
Audor Pharma	Alfatradiol	XP103DAA	1
Caelo	Alfatradiol	11061004	1

- 55 807 spectra from 335 *Apo-Ident* customers from a total of 20 533 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Alfatradiol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Alfatradiol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	480	0	75 398
Type B	0	350	0	80 998
Type C	0	184	10	55 807

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.7500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.2857 %)
Type C	100.0000 % (> 99.8622 %)	94.8454 % (> 93.2990 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20292	20940	6.56	34.32
20940	20940	0.00	34.74
21476	20940	7.51	34.49
21477	20940	7.22	33.05
21714	21714	0.00	29.79
22511	22511	0.00	36.59
22934	20940	5.00	34.74

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Allantoin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20079-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Allantoin; Allantoinum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Allantoin	91749379	20079	40	F 2009 000 959
Fagron	Allantoin	13I03-B05	21216	40	20130927
Euro OTC	Allantoin	1406011-01	21625	40	20140718
Euro OTC	Allantoin	1609012	22750	40	20161006*
Euro OTC	Allantoin	1609012-01	22810	40	20161006

Validation samples

A total of 213 227 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 *Allantoin*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Allantoin	1406011-01	21625 [†]	20
Caelo	Allantoin	162289	22756	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 215 spectra from 76 *Apo-Ident* customers from 67 batches from the substance/substance group *Allantoin*.

Supplier	Substance	Batch	Spectra
Caelo	Allantoin	2264594	1

continued on the next page

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

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Allantoin	3091301	1
Caelo	Allantoin	5051402	1
Caelo	Allantoin	10064008	1
Caelo	Allantoin	10064012	1
Caelo	Allantoin	10064015	1
Caelo	Allantoin	10318304	2
Caelo	Allantoin	10318305	1
Caelo	Allantoin	10318313	2
Caelo	Allantoin	10318312	1
Caelo	Allantoin	1113E-01087	1
Anzag	Allantoin	10318315	1
Caelo	Allantoin	11247504	6
Caelo	Allantoin	11247510	5
Noweda	Allantoin	11J11-N11	1
Caelo	Allantoin	11247511	1
Fagron	Allantoin	11J11-N11	3
Anzag	Allantoin	12251501	1
Caelo	Allantoin	1225101	1
Caelo	Allantoin	12251501	6
Sanacorp	Allantoin	12251501	1
Caelo	Allantoin	12251502	2
Caelo	Allantoin	12251505	10
Caesar & Loretz GmbH	Allantoin	12251505	1
Caelo	Allantoin	12251509	1
Caelo	Allantoin	12251510	9
DSM Nutritional Prod./ ...	Allantoin	12251505	1
Gehe	Allantoin	12251510	1
Sanacorp	Allantoin	12251510	1
Caesar & Loretz GmbH	Allantoin	12251510	1
Caesar & Loretz GmbH	Allantoin	12374403	1
Caelo	Allantoin	12374403	8
celo/Jenne	Allantoin	12374403	1
Caelo	Allantoin	12374404	2
Caelo	Allantoin	12374407	6
Sanacorp	Allantoin	12374409	2
Caelo	Allantoin	12374409	14
Caesar & Loretz GmbH	Allantoin	12374409	1
Caesar&Loretz GmbH	Allantoin	12374409	1
Caelo	Allantoin	12374414	7
Caelo	Allantoin	12374415	9
Caesar & Loretz GmbH	Allantoin	12374415	1
Caesar & Loretz GmbH	Allantoin	12374416	1
Caelo	Allantoin	12374418	2
Caelo	Allantoin	12374417	1
Caelo	Allantoin	12374422	3
Caelo	Allantoin	12374423	4
Sanacorp	Allantoin	12374422	1
Noweda	Allantoin	12B09-N08	2
Fagron	Allantoin	12B09-N09	1
Fagron	Allantoin	12C30-N04	2
Caelo	Allantoin	12b09-no8	1
Noweda	Allantoin	13A21-N07	2
Fagron	Allantoin	13A21-N07	3
Fagron	Allantoin	13G16-N07	8
Fagron	Allantoin	13I03-B05-289430	1
Euro OTC	Allantoin	1401046-01	4
Phoenix 08.10.14	Allantoin	1401046-01	1
Euro OTC	Allantoin	140104601	1
Euro OTC	Allantoin	1406011-01	6
Euro OTC	Allantoin	1406011-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Allantoin	14247602	5
Euro OTC	Allantoin	140601103	1
Caesar & Loretz GmbH	Allantoin	14247602	1
Caelo	Allantoin	14247609	4
Caelo	Allantoin	15220004	3
Caelo	Allantoin	15220005	2
Caelo	Allantoin	15220006	8
Caelo	Allantoin	15220007	1
Caelo	Allantoin	15220008	3
Caelo	Allantoin	15220010	2
Caelo	Allantoin	15220012	4
Caelo	Allantoin	15220011	1
Caelo	Allantoin	20071202	1
Caelo	Allantoin	15275302	1
Caelo	Allantoin	20140612-15	1
Caelo	Allantoin	24061401	1
Caelo	Allantoin	2713431	1
Caelo	Allantoin	2713448	1
Caelo	Allantoin	81542358	4
Fagron	Allantoin	K93403115	1
Caelo	Allantoin	12374416	1
Caelo	Allantoin	10318306	1
Caelo	Allantoin	12251511	1
Caelo	Allantoin	12374401	1
Caelo	Allantoin	4908E-01087	1

- 55 786 spectra from 335 *Apo-Ident* customers from a total of 20 545 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	60	0	81 288
Type C	0	212	3	55 786

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	98.6047 % (> 97.2093 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20079	20079	0.00	45.83
21216	22750	7.65	45.33
21625	22750	7.03	44.92
22750	22750	0.00	44.65
22810	22750	4.97	45.54

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Allopurinol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22243-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Allopurinol; Allopurinolum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Allopurinol*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 93 spectra of 4 reference samples from the substance/substance group *Allopurinol*.

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

- 81 255 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Allopurinol*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

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

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	93	0	81 255
Type C	0	0	0	56 001

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 93.5484 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22243	22243	0.00	71.53
22345	22243	2.29	70.84

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **alpha-tocopheryl acetate dry concentrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20433-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

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

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	alpha-tocopheryl...	1110021-02	20907	40	20120104
Fagron	alpha-tocopheryl...	13H30-B02-287169	21609	40	AR-15-FG-006388-01
Euro OTC	alpha-tocopheryl...	1305032-01	21680	40	AR-15-FG-001194-01
Euro OTC	alpha-tocopheryl...	1507001	21842	40	0000010503
Fagron	alpha-tocopheryl...	14B03-B04-295113	21959	40	20140224
Euro OTC	alpha-tocopheryl...	1603046	22543	40	20160429*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *alpha-tocopheryl acetate dry concentrate*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *alpha-tocopheryl acetate dry concentrate*.

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

- 81 188 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 17 spectra from 4 *Apo-Ident* customers from 11 batches from the substance/substance group *alpha-tocopheryl acetate dry concentrate*.

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

- 55 984 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	120	40	81 188
Type C	0	13	4	55 984

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	75.0000 % (> 73.1250 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20907	21680	4.60	36.19
21609	21609	0.00	30.62
21680	21680	0.00	35.39
21842	21842	0.00	31.24
21959	21680	4.83	39.36
22543	22543	0.00	31.94

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ambroxol hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20742-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ambroxol hydrochloride; Ambroxoli hydrochloridum; Ambroxolum hydrochloricum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Ambroxol hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 140 spectra of 5 reference samples from the substance/substance group *Ambroxol hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ambroxol hydrochloride	1509032	21942 [†]	20
Euro OTC	Ambroxol hydrochloride	1601008	22298 [†]	20
Euro OTC	Ambroxol hydrochloride	1602015	22347 [†]	20
Caelo	Ambroxol hydrochloride	161996	22636	40
Euro OTC	Ambroxol hydrochloride	1609002	22800	40

- 81 208 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 8 spectra from 6 *Apo-Ident* customers from 7 batches from the substance/substance group *Ambroxol hydrochloride*.

Supplier	Substance	Batch	Spectra
Euro OTC	Ambroxol hydrochloride	1311032-01	1
Euro/Noweda	Ambroxol hydrochloride	1509032-01	1
EuroTOC	Ambroxol hydrochloride	1602015-01	1
Phoenix	Ambroxol hydrochloride	1604035-02	1
Euro OTC	Ambroxol hydrochloride	1604035-01	1
Euro OTC	Ambroxol hydrochloride	1604035-02	1
Chem & Pharma	Ambroxol hydrochloride	AXL0361201310	1
Fagron	Ambroxol hydrochloride	12K12-N02	1

- 55 993 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	140	0	81 208
Type C	0	8	0	55 993

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20742	20742	0.00	44.19
21230	22347	2.25	43.78
21244	22347	3.16	43.55
21942	21942	0.00	45.24
22298	22298	0.00	43.94
22347	22347	0.00	43.51
22550	22550	0.00	44.11

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Amiloride hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21879-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Amiloride hydrochloride; Amiloridi hydrochloridum; Amiloridum hydrochloricum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Amiloride hydroc...	13J08-B04-288620	21879	40	AR-16-FG-008919-01
Fagron	Amiloride hydroc...	13J08-B04-304547	22339	40	20131024

Validation samples

A total of 213 227 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 *Amiloride hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 80 spectra of 3 reference samples from the substance/substance group *Amiloride hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Amiloride hydrochloride	13J08-B04-288620	21879 [†]	20
Fagron	Amiloride hydrochloride	13J08-B04-304547	22339 [†]	20
Fagron	Amiloride hydrochloride	15C25-B05-325653	22834	40

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Amiloride hydrochloride*.

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

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	80	0	81 268
Type C	0	1	0	56 000

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21879	21879	0.00	58.55
22339	21879	7.10	52.92

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Amphotericin B**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20933-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Amphotericin B; Amphotericinum B

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Amphotericin B*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 72 spectra of 3 reference samples from the substance/substance group *Amphotericin B*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Amphotericin B	13I16-N02	21951 [†]	20
Euro OTC	Amphotericin B	1512026-01	22813	40
Euro OTC	Amphotericin B	1305033-03	not required	12

- 81 276 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Amphotericin B*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

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

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	72	0	81 276
Type C	0	0	0	56 001

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 91.6667 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20933	20933	0.00	19.53
21338	21338	0.00	27.29
21951	21338	1.35	27.51

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Arginine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20391-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Arginine; Argininium

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Arginine	13J28-B02	21226	40	AR-15-FG-008045-01
Euro OTC	Arginine	1604003	22514	40	20160425*
Euro OTC	Arginine	1608031	22801	40	20160916*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Arginine*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

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

- 81 168 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 34 spectra from 9 *Apo-Ident* customers from 20 batches from the substance/substance group *Arginine*.

Supplier	Substance	Batch	Spectra
Caelo	Arginine	1410018-01	1

continued on the next page

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

continued from previous page

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

- 55 967 spectra from 335 *Apo-Ident* customers from a total of 20 591 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	180	0	81 168
Type C	0	34	0	55 967

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 82.3529 %)

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

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

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21226	21226	0.00	40.29
22514	22514	0.00	39.71
22801	22801	0.00	43.70

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Arginine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20657-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Arginine hydrochloride; Arginini hydrochloridum; Argininum hydrochloricum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Arginine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 100 spectra of 3 reference samples from the substance/substance group *Arginine hydrochloride*.

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

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 5 *Apo-Ident* customers from 12 batches from the substance/substance group *Arginine hydrochloride*.

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

- 55 985 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	0	81 248
Type C	0	15	1	55 985

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20657	21776	11.70	49.19
20964	20964	0.00	49.51
21776	21776	0.00	47.77

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ascorbic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20394-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ascorbic acid; Acidum ascorbicum; Acidum ascorbinicum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ascorbic acid	09306404	20394	40	AR-12-FG-009254-01
Fagron	Ascorbic acid	13G29-B07	21229	40	1410500
Caelo	Ascorbic acid	12350011	21317	40	20121122
Euro OTC	Ascorbic acid	1612018	22918	40	20170109*
Caelo	Ascorbic acid	163452	23062	40	20170125*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ascorbic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

Supplier	Substance	Batch	Sample ID	Spectra
Hebei Welcome Pharmaceu...	Ascorbic acid	1107411106	20430	40
Caelo	Ascorbic acid	160569	22483	60
Euro OTC	Ascorbic acid	1607025	22672	40
Euro OTC	Ascorbic acid	1605024	22680	40
Euro OTC	Ascorbic acid	1609015	22789	40

- 81 128 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 49 spectra from 30 *Apo-Ident* customers from 44 batches from the substance/substance group *Ascorbic acid*.

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

Supplier	Substance	Batch	Spectra
Caelo	Ascorbic acid	14123809	2
Caelo	Ascorbic acid	15300002	2
Caelo	Ascorbic acid	1071404	1
Euro OTC	Ascorbic acid	10071418	1
Euro OTC	Ascorbic acid	12061408	1
Caelo	Ascorbic acid	12350011	1
pharmorgana	Ascorbic acid	1304413505	1
Caelo	Ascorbic acid	14123910	1
Caelo	Ascorbic acid	14123915	1
Euro OTC	Ascorbic acid	1308008-01	1
Caelo	Ascorbic acid	15084503	1
Caelo	Ascorbic acid	14214403	1
Euro OTC	Ascorbic acid	17041406	1
Caelo	Ascorbic acid	15084507	1
Pharma Greven	Ascorbic acid	D201503108	1
Canea Pharma/Sanacorp	Ascorbic acid	VC1450	1
Euro OTC	Ascorbic acid	L-1202011-02	1
Caelo	Ascorbic acid	2061203	1
Zentiva/Alliance Health...	Ascorbic acid	15300007	1
NCPC	Ascorbic acid	1107411106	1
Caelo	Ascorbic acid	11208608	1
Euro OTC	Ascorbic acid	11121302	1
Caelo	Ascorbic acid	11208606	1
Caesar & Loretz GmbH	Ascorbic acid	11208606	1
Fagron	Ascorbic acid	12/25-N04	1
Caelo	Ascorbic acid	12349909	1
Premium Ingredients Int...	Ascorbic acid	2012444403	1
REWE Food Ingredients	Ascorbic acid	11572008237103	1
Caelo	Ascorbic acid	12350003	1
Caelo	Ascorbic acid	12350005	2
Euro OTC	Ascorbic acid	28081303	1
NE GPF	Ascorbic acid	DY0261121205	1
Gesundform	Ascorbic acid	L1110704	1
Amos Vital	Ascorbic acid	L1120454	1
AmsVital GmbH	Ascorbic acid	L1220572	1
Euro OTC	Ascorbic acid	L1202011-02	1
canea, gehe	Ascorbic acid	VC1242	1
Wepa Paulus	Ascorbic acid	11406201	1
Caelo	Ascorbic acid	14214404	1
Caelo	Ascorbic acid	14044701/3	1
Euro OTC	Ascorbic acid	17011404	1
Caelo	Ascorbic acid	22101302	1
Wepa	Ascorbic acid	261120415	1
Anzag/Gehe Balance	Ascorbic acid	L1210232	1
Amos Vital	Ascorbic acid	L1230216	2

- 55 952 spectra from 335 *Apo-Ident* customers from a total of 20 567 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ascorbic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ascorbic acid* and it was evaluated

how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	220	0	81 128
Type C	0	44	5	55 952

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8622 %)	89.7959 % (> 83.6735 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20394	20394	0.00	66.56
21229	21229	0.00	61.95
21317	21229	3.17	60.01
22918	22918	0.00	66.50
23062	23062	0.00	65.18

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ascorbyl palmitate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21053-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ascorbyl palmitate; Acidum palmitoylascorbicum; Ascorbylis palmitas

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 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 *Ascorbyl palmitate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Ascorbyl palmitate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ascorbyl palmitate	13C06-B40-291206	21665 [†]	20
Fagron	Ascorbyl palmitate	15F01-B99-309774	21851 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 12 batches from the substance/substance group *Ascorbyl palmitate*.

Supplier	Substance	Batch	Spectra
Fagron	Ascorbyl palmitate	15f01-b99-309774	1
Bionorica	Ascorbyl palmitate	74736	1
Bionorica	Ascorbyl palmitate	74962	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
Fagron	Ascorbyl palmitate	14I03-N01	1
Bionorica/Noweda	Ascorbyl palmitate	77773	2
Fagron	Ascorbyl palmitate	13C06-B40-291206	2
Fagron	Ascorbyl palmitate	15F01-B99	1
Caelo	Ascorbyl palmitate	16B10-B04324111	1
Bionorica	Ascorbyl palmitate	82275	1
Fagron	Ascorbyl palmitate	15F01-B99-525121	2
Bionorica	Ascorbyl palmitate	85532	1
PHOENIX 30.06.2014	Ascorbyl palmitate	UQ21206229	1

- 55 986 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	11	4	55 986

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21053	21053	0.00	56.40
21665	21053	13.13	51.09
21851	21053	14.87	51.09

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Atropine sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20653-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Atropine sulfate; Atropine sulphate; Atropini sulfas; Atropinum sulfuricum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

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

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 285 spectra of 7 reference samples from the substance/substance group *Atropine sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 593 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 240 spectra of 8 reference samples from the substance/substance group *Atropine sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Atropine sulfate	14336806	21719 [†]	20
Caelo	Atropine sulfate	15301601	21920 [†]	20
Fagron	Atropine sulfate	16G20-B06-328437	22932	40
Caelo	Atropine sulfate	16326802	22952	40
Caelo	Atropine sulfate	14336806	21719SI [†]	20
Caelo	Atropine sulfate	15301601	21920SI [†]	20
Fagron	Atropine sulfate	16G20-B06-328437	22932SI	40
Caelo	Atropine sulfate	16326802	22952SI	40

- 81 108 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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*.

- 11 spectra from 8 *Apo-Ident* customers from 10 batches from the substance/substance group *Atropine sulfate*.

Supplier	Substance	Batch	Spectra
Caelo	Atropine sulfate	14336807	1
Caelo	Atropine sulfate	13357403	1
Caelo	Atropine sulfate	13357405	1
Caelo	Atropine sulfate	15115201	2
Caelo	Atropine sulfate	12244206	1
Phönix	Atropine sulfate	15301607	1
Gehe	Atropine sulfate	16326802	1
Noweda	Atropine sulfate	12250403	1
Caelo	Atropine sulfate	13173809	1
fargon	Atropine sulfate	13K01-N01	1

- 55 990 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	285	0	75 593
Type B	0	240	0	81 108
Type C	0	11	0	55 990

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8947 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20653	20653	0.00	32.38
21088	21088	0.00	32.38
21551	21551	0.00	31.26
21719	21719	0.00	38.10
21920	21719	11.89	36.83

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Bacitracin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20851-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bacitracin; Bacitracinum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Bacitracin	13A-03-N11	20851	20	1401189
Fagron	Bacitracin	14A21-B09-292909	21657	40	1511741
Roth	Bacitracin	194169081	21658	40	20140508
Fagron	Bacitracin	14E23-B03-296243	21686	30	1503715
Fagron	Bacitracin	15C12-B06-309185	21898	40	20150324
Fagron	Bacitracin	15C12-B06-309185	21986	40	9466
Fagron	Bacitracin	16B17-B03-322939	22739	40	20160421

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 250 spectra of 7 reference samples from the substance/substance group *Bacitracin*. These samples are listed above in the [calibration samples](#) section.
- 75 628 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 290 spectra of 9 reference samples from the substance/substance group *Bacitracin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Bacitracin	9J30-N01	20218	40
Fagron	Bacitracin	13A-03-N11	20851 [†]	20
Fagron	Bacitracin	14A21-B09-292909	21657 [†]	20
Roth	Bacitracin	194169081	21658 [†]	20
Fagron	Bacitracin	14E23-B03-296243	21686 [†]	30
Fagron	Bacitracin	15C12-B06-309185	21898 [†]	20
Fagron	Bacitracin	15C12-B06-309185	21986 [†]	20
Fagron	Bacitracin	14A21-B09-292909	21657SI	60
Fagron	Bacitracin	15C12-B06-309185	21898SI	60

- 81 058 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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*.

- 47 spectra from 29 *Apo-Ident* customers from 30 batches from the substance/substance group *Bacitracin*.

Supplier	Substance	Batch	Spectra
Fagron	Bacitracin	11J17-N01	2
Fagron	Bacitracin	11/17-N01	1
Fagron	Bacitracin	11E23-N10	1
Fagron	Bacitracin	12G12-N17	1
Fagron	Bacitracin	14A21-B09-290643	2
Fagron	Bacitracin	13B25-B01	1
Fagron	Bacitracin	13A03-N11	1
Fagron	Bacitracin	14A21-B09	2
Fagron	Bacitracin	13D26-N08	1
Fagron	Bacitracin	14A21-B09-292908	2
Fagron	Bacitracin	14E23-B03	3
Caelo	Bacitracin	14A21-B09-292908	1
Fagron	Bacitracin	14E23-B03-296243	6
Caelo	Bacitracin	14E23-B03-296243	2
Fagron	Bacitracin	14e23-b03-296243	1
Fagron	Bacitracin	14E23-B03-333424	1
Fagron	Bacitracin	14E23-B03-303425	1
Fagraon	Bacitracin	14E23-B03-303424	1
Caelo	Bacitracin	15080605	1
Fagron	Bacitracin	15C12-B06-309185	1
Fagron	Bacitracin	15C12-B06	1
Fargon/Phönix	Bacitracin	15C12-B06-312975	1
Caelo	Bacitracin	15C12-B06-317782	1
Fagron	Bacitracin	16B17-B03	1
Fagron	Bacitracin	28051509	1
Fagron	Bacitracin	16B17-B03-322891	2
Phönix Gotha	Bacitracin	C2280010	1
Fagron	Bacitracin	C2280017	3
Fagron	Bacitracin	31071503	1
Fagron	Bacitracin	211531	1
Fagron	Bacitracin	700193-0001	1
Fagron	Bacitracin	13C13-N10	1

- 55 954 spectra from 335 *Apo-Ident* customers from a total of 20 581 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	250	0	75 628
Type B	0	206	84	81 058
Type C	0	42	5	55 954

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.6000 %)
Type B	100.0000 % (> 99.9853 %)	71.0345 % (> 70.0000 %)
Type C	100.0000 % (> 99.8622 %)	89.3617 % (> 82.9787 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20851	20851	0.00	21.07
21657	21657	0.00	24.87
21658	21986	3.95	25.22
21686	21686	0.00	11.19
21898	21986	4.33	25.77
21986	21986	0.00	24.84
22739	21986	7.78	21.97

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Beclometasone dipropionate, anhydrous
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	21046-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

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

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Beclometasone di...	13I05-N03	21046	40	1511689
Fagron	Beclometasone di...	13E02B40293328	21554	40	20140508
Euro OTC	Beclometasone di...	1203022-03	21634	25	1509281
Fagron	Beclometasone di...	13E02-B40-296353	21977	40	20140508
Euro OTC	Beclometasone di...	1203022-03	21995	40	20120424

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Beclometasone di...	1502032	22989	40	20150327*
Fagron	Beclometasone di...	13E02-B40-296353	21977SI	20	20140508
Euro OTC	Beclometasone di...	1203022-03	21995SI	19	20120424
Euro OTC	Beclometasone di...	1502032	22989SI	30	20150327*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 294 spectra of 9 reference samples from the substance/substance group *Beclometasone dipropionate, anhydrous*. These samples are listed above in the [calibration samples](#) section.
- 75 584 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 133 spectra of 6 reference samples from the substance/substance group *Beclometasone dipropionate, anhydrous*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Beclometasone dipropionate, ...	11C01-N03	20293	40
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21634 [†]	35
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	21977 [†]	20
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21995 [†]	20
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	21977SI [†]	9
Euro OTC	Beclometasone dipropionate, ...	1203022-03	21995SI [†]	9

- 81 215 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

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

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

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

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 36 spectra from 8 *Apo-Ident* customers from 20 batches from the substance/substance group *Beclometasone dipropionate, anhydrous*.

Supplier	Substance	Batch	Spectra
Euro OTC	Beclometasone dipropionate, ...	1203022-03	1
Fagron	Beclometasone dipropionate, ...	13E02-B40	1
Fagron	Beclometasone dipropionate, ...	13/05-N03	1
Fagron	Beclometasone dipropionate, ...	13/05-N03	1
Fagron	Beclometasone dipropionate, ...	13E02-B40-293327	4
Fagron	Beclometasone dipropionate, ...	13I05-N03	3
Fagron	Beclometasone dipropionate, ...	13E02-B40-296354	2
Fagron	Beclometasone dipropionate, ...	13E02-B40-296353	1
Fagron	Beclometasone dipropionate, ...	13E02-B40-293328	2
Fagron	Beclometasone dipropionate, ...	14D04-B04-302336	3
Fagron	Beclometasone dipropionate, ...	13I05N03	1
Fagron	Beclometasone dipropionate, ...	14D04-B04302336	1
fragon	Beclometasone dipropionate, ...	700721-0004	1
Fagron	Beclometasone dipropionate, ...	C0783/112020	1
Fagron	Beclometasone dipropionate, ...	12D12-N03	5
Fagron	Beclometasone dipropionate, ...	11F28-N02	2
Euro OTC	Beclometasone dipropionate, ...	C0783111020	1
Euro OTC	Beclometasone dipropionate, ...	1203022-01	1
Fagron	Beclometasone dipropionate, ...	12G04-N11	3
Caelo	Beclometasone dipropionate, ...	12G04-n11	1

- 55 965 spectra from 335 *Apo-Ident* customers from a total of 20 591 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	294	0	75 584
Type B	0	119	14	81 215
Type C	0	30	6	55 965

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.9592 %)
Type B	100.0000 % (> 99.9853 %)	89.4737 % (> 87.2180 %)
Type C	100.0000 % (> 99.8622 %)	83.3333 % (> 75.0000 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21046	21046	0.00	12.18
21554	21634	4.36	11.40
21634	21634	0.00	11.17
21977	22989	3.70	11.50
21995	22989	3.07	11.46
22989	22989	0.00	11.37

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Benzocaine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20211-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Benzocaine; Aethylium paraaminobenzoicum; Benzocainum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Benzocaine	10K02-N01	20211	40	AR-12-FG-002996-01
Caelo	Benzocaine	12341904	20843	40	1411055
Fagron	Benzocaine	12E04-N06	21083	40	20120607
Caelo	Benzocaine	13213509	21563	40	20130726

Validation samples

A total of 213 227 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 *Benzocaine*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzocaine	10K02-N01	20219	40
Caelo	Benzocaine	13213509	21563 [†]	20
Caelo	Benzocaine	161740	22641	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 112 spectra from 76 *Apo-Ident* customers from 59 batches from the substance/substance group *Benzocaine*.

Supplier	Substance	Batch	Spectra
Fagron	Benzocaine	11K08-B40	3
Caelo	Benzocaine	13213502	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
Caelo	Benzocaine	13213511	2
Caelo	Benzocaine	12341904	6
Caelo	Benzocaine	2412M-01118	1
Fagron	Benzocaine	12H10-N06	4
Fagron	Benzocaine	400313	1
Caelo	Benzocaine	5021401	1
Caelo	Benzocaine	10072603	1
Fagron	Benzocaine	10K02-N01	1
Caelo	Benzocaine	1012ben	1
Caelo	Benzocaine	6031501	1
Fagron	Benzocaine	11/22-N03	1
Fagron	Benzocaine	104210-0001	1
Fagron	Benzocaine	11/22-N3	1
Caelo	Benzocaine	11127506	1
Caelo	Benzocaine	11305206	1
Caelo	Benzocaine	11127508	2
Fargon/Sana	Benzocaine	11K08-290049	1
Fagron	Benzocaine	11I22-N03	1
Fagron	Benzocaine	11K08-B40-291841	3
Fagron	Benzocaine	11K08-B40-291840	1
Fagron	Benzocaine	11K08B40290050	1
Fagron	Benzocaine	11k08-b40-291841	1
Caelo	Benzocaine	12115007	4
Caelo	Benzocaine	12115008	2
Caelo	Benzocaine	12115011	2
Phönix Gotha	Benzocaine	12115011	1
Fagron	Benzocaine	12E04-N06	10
Fagron	Benzocaine	12341904	1
Caelo	Benzocaine	12341906	1
Fargon	Benzocaine	12H10-N06	1
Caelo	Benzocaine	1313509	1
Phoenix	Benzocaine	12H10-N06	1
Sanacorp	Benzocaine	13213502	1
Caelo	Benzocaine	13213509	6
Sanacorp	Benzocaine	13213506	1
Caelo	Benzocaine	13213515	1
Anzag / Noweda	Benzocaine	1321351	1
Fagron	Benzocaine	13F06-N10	1
Caelo	Benzocaine	13213516	1
Phönix	Benzocaine	13F06-N10	1
Fagron	Benzocaine	13L06-B02	2
Fagron	Benzocaine	13L06-B02-294100	2
Caelo	Benzocaine	14277502	3
Caelo	Benzocaine	13L06-B02-294112	1
Fagron	Benzocaine	13L06-B02-300494	1
Fagron	Benzocaine	14G02-B01-310324	2
Caelo	Benzocaine	1515I-01118	1
Caelo	Benzocaine	15227302	2
Caelo	Benzocaine	15227307	2
Fagron	Benzocaine	15227307	1
Caelo	Benzocaine	15227315	2
Caelo	Benzocaine	15227314	2
Fagron	Benzocaine	15C19-B04-322019	1
Caelo	Benzocaine	19031301	1
Caelo	Benzocaine	24081212	1
Caelo	Benzocaine	3784947	1
Fagron	Benzocaine	4413E-01118	1
Fagron	Benzocaine	BZ-27/1112	1
Caelo	Benzocaine	91062169	1
s.Prüfprotokoll	Benzocaine		1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Benzocaine	BZ-08/11-12	1
Caelo	Benzocaine		1
Fagron	Benzocaine	13L06-B02297505	1
Fagron	Benzocaine	15C19-B04	1

- 55 889 spectra from 335 *Apo-Ident* customers from a total of 20 553 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	100	0	81 248
Type C	0	98	14	55 889

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	87.5000 % (> 84.8214 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20211	20211	0.00	86.84
20843	20843	0.00	91.21
21083	20211	23.92	90.13
21563	20843	18.76	93.20

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Benzoic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20041-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Benzoic acid; Acidum benzoicum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Benzoic acid	09B25-N03	20041	30	I 2009 000 348
Caelo	Benzoic acid	13391310	21458	40	20131216

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 70 spectra of 2 reference samples from the substance/substance group *Benzoic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 808 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 63 spectra of 3 reference samples from the substance/substance group *Benzoic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzoic acid	9B25-N03	20041 [†]	3
Caelo	Benzoic acid	13391310	21458 [†]	20
Caelo	Benzoic acid	15084614	22664	40

- 81 285 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 13 *Apo-Ident* customers from 11 batches from the substance/substance group *Benzoic acid*.

Supplier	Substance	Batch	Spectra
Caelo	Benzoic acid	1339120	1
Caelo	Benzoic acid	13391320	1

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Benzoic acid	15084603	2
Caelo	Benzoic acid	13391310	1
Caelo	Benzoic acid	15084607	1
Caelo	Benzoic acid	15084701	1
Caleo/Phoenix	Benzoic acid	15084607	1
Phönix	Benzoic acid	13074605	1
Gatt-Koller / Phoenix	Benzoic acid	2992/07131314	2
Caelo	Benzoic acid	13074605	3
Caelo	Benzoic acid	10156104	1
Caelo	Benzoic acid	13074610	2
Caelo	Benzoic acid	90179109	1

- 55 983 spectra from 335 *Apo-Ident* customers from a total of 20 600 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	70	0	75 808
Type B	0	63	0	81 285
Type C	0	16	2	55 983

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 91.4286 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.4762 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20041	20041	0.00	83.30
21458	20041	7.52	79.90

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Benzydamine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20624-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Benzydamine hydrochloride; Benzydamini hydrochloridum; Benzydaminum hydrochloricum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Benzydamine hydr...	12D26-N14	20624	40	1402328
Fagron	Benzydamine hydr...	14I30-B04-300713	21699	30	AR-15-FG-015977-01
Fagron	Benzydamine hydr...	15I17-B02-315060	22268	40	20151211

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Benzydamine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 35 spectra of 2 reference samples from the substance/substance group *Benzydamine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Benzydamine hydrochloride	14I30-B04-300713	21699 [†]	15
Fagron	Benzydamine hydrochloride	15I17-B02-315060	22268 [†]	20

- 81 313 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 12 batches from the substance/substance group *Benzydamine hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Benzydamine hydrochloride	12C20-N02	1
Fagron	Benzydamine hydrochloride	14B25-B01-294054	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
Fagron	Benzydamine hydrochloride	15A14-B05-303068	1
Fagron	Benzydamine hydrochloride	15A14-B05	1
Fagron	Benzydamine hydrochloride	1503309P	1
Fagron	Benzydamine hydrochloride	1503313P	1
Fagron	Benzydamine hydrochloride	13A15-N03	1
Fagron	Benzydamine hydrochloride	12K07-N16	1
Fagron	Benzydamine hydrochloride	12j10-n03	1
Fagron	Benzydamine hydrochloride	15I17-B02	1
FARGON	Benzydamine hydrochloride	13h19-n06	1
Fagron	Benzydamine hydrochloride	13H19N06	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	35	0	81 313
Type C	0	12	0	55 989

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 82.8571 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20624	20624	0.00	31.27
21699	21699	0.00	36.60
22268	20624	4.56	33.13

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Betaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20483-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Betaine hydrochloride; Betaini hydrochloridum; Betainum hydrochloricum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betaine hydrochl. . .	12A03-N08	20483	40	20120104
Fagron	Betaine hydrochl. . .	13H13-N02	20969	40	1402684

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Betaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 0 spectra of 0 reference samples from the substance/substance group *Betaine hydrochloride*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 batches from the substance/substance group *Betaine hydrochloride*.

Supplier	Substance	Batch	Spectra
Euro OTC	Betaine hydrochloride	1305027-01	2
Fagron	Betaine hydrochloride	13H13-N02	1
Fagron	Betaine hydrochloride	12C20-N09	1
Fagron	Betaine hydrochloride	15121401	1
Euro OTC	Betaine hydrochloride	1202008-01	1
Fagron	Betaine hydrochloride	13G29-B02-294870	1
Fagron	Betaine hydrochloride	24091301	1
Gatt-Koller	Betaine hydrochloride	2970/07102910	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	0	0	81 348
Type C	0	8	1	55 992

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20483	20969	12.25	72.82
20969	20969	0.00	74.05

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Betaine monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20498-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Betaine monohydrate; Betainum monohydricum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Betaine monohydr...	11117715	20498	40	20110518
Caelo	Betaine monohydr...	12336602	20991	40	1403327
Fagron	Betaine monohydr...	14126-B06-309878	21956	40	20141212

Validation samples

A total of 213 227 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 *Betaine monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Betaine monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betaine monohydrate	14I26-B06-309878	21956 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Betaine monohydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Betaine monohydrate	14A14-B02-292983	1
Caelo	Betaine monohydrate	4312172831	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	20	0	81 328
Type C	0	2	0	55 999

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20498	20991	4.56	60.08
20991	20991	0.00	59.73
21956	20991	2.83	59.64

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Betamethasone dipropionate, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20930-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Betamethasone dipropionate, micronized; Betamethasoni dipropionas micronisatum; Betamethasonum dipropionicum micronisatum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betamethasone di...	13I17-N05	20930	40	1401377
Fagron	Betamethasone di...	13I17-N05	20952	80	20130926
Caelo	Betamethasone di...	13372501	21250	40	AR-15-FG-005428-01
Caelo	Betamethasone di...	13236803	21366	40	20130730
Caelo	Betamethasone di...	13236803	21367	35	20130730

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Betamethasone di...	1311023-01	21716	40	1505455
Euro OTC	Betamethasone di...	1601034	22372	30	20160204*
Fagron	Betamethasone di...	16C04-B03-324513	22898	40	20160421
Caelo	Betamethasone di...	13372501	21250SI	30	AR-15-FG-005428-01
Caelo	Betamethasone di...	13236803	21366SI	31	20130730
Caelo	Betamethasone di...	13236803	21367SI	40	20130730
Euro OTC	Betamethasone di...	1311023-01	21716SI	30	1505455
Euro OTC	Betamethasone di...	1601034	22372SI	30	20160204*
Fagron	Betamethasone di...	16C04-B03-324513	22898SI	39	20160421

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 545 spectra of 14 reference samples from the substance/substance group *Betamethasone dipropionate, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 333 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 226 spectra of 10 reference samples from the substance/substance group *Betamethasone dipropionate, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone dipropionate, ...	10K09-N06	20256	40
Euro OTC	Betamethasone dipropionate, ...	1311023-01	21716 [†]	20
Euro OTC	Betamethasone dipropionate, ...	1601034	22372 [†]	15
Euro OTC	Betamethasone dipropionate, ...	1610014	22851	40
Caelo	Betamethasone dipropionate, ...	13372501	21250SI [†]	15
Caelo	Betamethasone dipropionate, ...	13236803	21366SI [†]	15
Caelo	Betamethasone dipropionate, ...	13236803	21367SI [†]	20
Euro OTC	Betamethasone dipropionate, ...	1311023-01	21716SI [†]	16
Euro OTC	Betamethasone dipropionate, ...	1601034	22372SI [†]	15
Euro OTC	Betamethasone dipropionate, ...	1610014	22851SI	30

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

- 81 122 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 222 spectra from 112 *Apo-Ident* customers from 78 batches from the substance/substance group *Betamethasone dipropionate, micronized*.

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone dipropionate, ...	8K03-N13	2
Fagron	Betamethasone dipropionate, ...	13/17-N05	10
Fagron	Betamethasone dipropionate, ...	13/17-n05	1
Caelo	Betamethasone dipropionate, ...	13/17-N05	2
Caelo	Betamethasone dipropionate, ...	1303006-01	1
Fargon/ Noweda	Betamethasone dipropionate, ...	13/17-N05	1
Euro OTC	Betamethasone dipropionate, ...	1305041-01	6
Euro OTC	Betamethasone dipropionate, ...	1311023-01	5
Euro OTC	Betamethasone dipropionate, ...	131102301	1
Euro OTC	Betamethasone dipropionate, ...	1311023-02	3
Fagron	Betamethasone dipropionate, ...	1317-N05	1
Caelo	Betamethasone dipropionate, ...	13236802	5
Caelo	Betamethasone dipropionate, ...	13236801	3
Caelo	Betamethasone dipropionate, ...	13236803	1
Caelo	Betamethasone dipropionate, ...	13236806	3
Phoenix 03.04.20147	Betamethasone dipropionate, ...	13236805	1
Caelo	Betamethasone dipropionate, ...	13236805	5
Phoenix	Betamethasone dipropionate, ...	13236806	1
Euro OTC	Betamethasone dipropionate, ...	13372501	1
Caelo	Betamethasone dipropionate, ...	13372503	5
Caelo	Betamethasone dipropionate, ...	13372501	3
Caelo	Betamethasone dipropionate, ...	13372504	4
Caelo	Betamethasone dipropionate, ...	13372514	6
Caelo	Betamethasone dipropionate, ...	13372515	2
Caelo	Betamethasone dipropionate, ...	13372516	5
Fagron	Betamethasone dipropionate, ...	13I17-N05	10
Fagron	Betamethasone dipropionate, ...	13J16-B01-291844	1
Alliance health	Betamethasone dipropionate, ...	13I17-N05	1
Fagron	Betamethasone dipropionate, ...	13J16-B01-291845	2
Fagron	Betamethasone dipropionate, ...	13j16-b01-291845	1
Caelo	Betamethasone dipropionate, ...	140507	1
Fagron	Betamethasone dipropionate, ...	14C03-B06-296837	3
Fagron	Betamethasone dipropionate, ...	14C03-B06	1
Anzag/fagromn	Betamethasone dipropionate, ...	14C03-B06-296837	1
Euro OTC	Betamethasone dipropionate, ...	1503003-01	3
Euro OTC	Betamethasone dipropionate, ...	1503003-02	4
Euro/Sanacorp	Betamethasone dipropionate, ...	1503003-02	1
Caelo	Betamethasone dipropionate, ...	1503003-02	1
Euro OTC	Betamethasone dipropionate, ...	150300302	1

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone dipropionate, ...	15163301	14
Caelo	Betamethasone dipropionate, ...	15163302	1
Caelo	Betamethasone dipropionate, ...	15163303	5
Caelo	Betamethasone dipropionate, ...	15163304	2
Caelo	Betamethasone dipropionate, ...	15238701	2
Caelo	Betamethasone dipropionate, ...	15412907	1
Fagron	Betamethasone dipropionate, ...	15H25-B06-313088	1
Euro OTC	Betamethasone dipropionate, ...	160103401	1
Euro OTC	Betamethasone dipropionate, ...	1601034-01	5
Caelo	Betamethasone dipropionate, ...	2109DMOB00111322	1
Euro OTC	Betamethasone dipropionate, ...	Co0044/1A15020	1
Phönix Gotha	Betamethasone dipropionate, ...	11/02-N01	1
Fagron	Betamethasone dipropionate, ...	11I02-N01	1
Fagron	Betamethasone dipropionate, ...	11K28-N10	4
Fagron	Betamethasone dipropionate, ...	9J05-N09	1
Caelo	Betamethasone dipropionate, ...		1
Fagron	Betamethasone dipropionate, ...	10E19-N03	1
Fagron	Betamethasone dipropionate, ...	11D26-N06	2
Caelo	Betamethasone dipropionate, ...	12114501	1
Caelo	Betamethasone dipropionate, ...	1210020-01	1
Phönix 05.12.12	Betamethasone dipropionate, ...	12114505	1
Caelo	Betamethasone dipropionate, ...	12114506	1
Euro OTC	Betamethasone dipropionate, ...	121002001	1
Caelo	Betamethasone dipropionate, ...	12114507	3
Caelo	Betamethasone dipropionate, ...	12114511	2
Caelo	Betamethasone dipropionate, ...	12114513	3
Noweda	Betamethasone dipropionate, ...	12114509	1
Caelo	Betamethasone dipropionate, ...	12114512	1
Fagron	Betamethasone dipropionate, ...	12B27-N08	4
Fagron	Betamethasone dipropionate, ...	12827-N08	1
Bombastus	Betamethasone dipropionate, ...	12B27N08	1
Fagron	Betamethasone dipropionate, ...	12C21-N13	1
Alliance Health 24.01.2...	Betamethasone dipropionate, ...	13/17-N05	1
Caelo	Betamethasone dipropionate, ...	13023001	3
Caelo	Betamethasone dipropionate, ...	13023002	6
Caelo	Betamethasone dipropionate, ...	13023005	8
Fagron	Betamethasone dipropionate, ...	13023004	1
Euro OTC	Betamethasone dipropionate, ...	1303006/01	1
Hirsch	Betamethasone dipropionate, ...	1303006-01	1
Euro OTC	Betamethasone dipropionate, ...	1303006-02	1
Fagron	Betamethasone dipropionate, ...	1303006-02	1
Phönix	Betamethasone dipropionate, ...	1303006-02	1
Euro OTC	Betamethasone dipropionate, ...	1305041-02	2
Caelo/Sanacorp	Betamethasone dipropionate, ...	13125701	1
Caelo	Betamethasone dipropionate, ...	13125701	3
Caelo	Betamethasone dipropionate, ...	13125703	4
Euro OTC	Betamethasone dipropionate, ...	13125702	1
Fagron	Betamethasone dipropionate, ...		1
Noweda	Betamethasone dipropionate, ...	13236802	1
Caelo	Betamethasone dipropionate, ...	1325702	1
Caelo	Betamethasone dipropionate, ...	18121306	1
Caelo	Betamethasone dipropionate, ...	2313A-03644	1
Caelo	Betamethasone dipropionate, ...	AKD11	1
Euro OTC	Betamethasone dipropionate, ...	1303006-01	1
EUro/AHD	Betamethasone dipropionate, ...	1303006-01	3
Euro OTC	Betamethasone dipropionate, ...	130541-01	1

- 55 779 spectra from 335 *Apo-Ident* customers from a total of 20 534 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	545	0	75 333
Type B	0	223	3	81 122
Type C	0	200	22	55 779

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8991 %)
Type B	100.0000 % (> 99.9853 %)	98.6726 % (> 97.3451 %)
Type C	100.0000 % (> 99.8622 %)	90.0901 % (> 88.7387 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20930	20930	0.00	11.49
20952	21250	3.93	11.15
21250	21250	0.00	11.16
21366	20930	5.33	14.06
21367	20930	5.28	13.99
21716	21716	0.00	8.18
22372	22372	0.00	10.82
22898	20930	3.97	13.07

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Betamethasone valerate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20026-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Betamethasone valerate; Betamethasoni valeras; Betamethasonum valerianicum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Betamethasone va...	82806109	20026	30	I 2009 000 283
Fagron	Betamethasone va...	12K07-N23	20887	39	20121119
Euro OTC	Betamethasone va...	1208014-01	20920	40	20120928
Caelo	Betamethasone va...	13091213	21215	40	20130506
Fagron	Betamethasone va...	13K29-B32-288243	21566	40	20131210
Caelo	Betamethasone va...	13225507	21588	40	20130821

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Betamethasone va...	1406019-01	21645	40	20140725
Fagron	Betamethasone va...	13K05-B08-292651	21674	40	1511154
Euro OTC	Betamethasone va...	1510037	22249	40	20151215*
Euro OTC	Betamethasone va...	1610010	22861	40	20161116*
Euro OTC	Betamethasone va...	1510037	22249SI	20	20151215*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 409 spectra of 11 reference samples from the substance/substance group *Betamethasone valerate*. These samples are listed above in the [calibration samples](#) section.
- 75 469 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 214 spectra of 9 reference samples from the substance/substance group *Betamethasone valerate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone valerate	13K29-B32-288243	21566 [†]	20
Caelo	Betamethasone valerate	13225507	21588 [†]	20
Euro OTC	Betamethasone valerate	1406019-01	21645 [†]	20
Fagron	Betamethasone valerate	13K05-B08-292651	21674 [†]	20
Euro OTC	Betamethasone valerate	1510037	22249 [†]	20
Euro OTC	Betamethasone valerate	1606023	22716	40
Euro OTC	Betamethasone valerate	1510037	22249SI [†]	10
Euro OTC	Betamethasone valerate	1606023	22716SI	34
Euro OTC	Betamethasone valerate	1610010	22861SI	30

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

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

- 81 134 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 968 spectra from 244 *Apo-Ident* customers from 242 batches from the substance/substance group *Betamethasone valerate*.

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	8081502	1
Fagron	Betamethasone valerate	11E18-N03	3
Caesar & Loretz GmbH Hi...	Betamethasone valerate	120801402	1
Caelo	Betamethasone valerate	10106313	1
Euro OTC	Betamethasone valerate	1208014-03	5
Caelo	Betamethasone valerate	12003403	10
Euro OTC	Betamethasone valerate	1208014-04	8
Fagron	Betamethasone valerate	12K07N23	1
Caelo	Betamethasone valerate	123345	1
Fagron	Betamethasone valerate	12K07-N23	8
Fagron	Betamethasone valerate	12L11-N01	14
Fagron	Betamethasone valerate	12L11-N01	2
Symbotica Spec/Noweda	Betamethasone valerate	1208014-04	1
Fagron	Betamethasone valerate	13/17-B08-292649	1
Noweda	Betamethasone valerate	13091205	1
Caelo	Betamethasone valerate	13091205	12
Caelo	Betamethasone valerate	13091203	10
Phönix	Betamethasone valerate	13091209	2
Caelo	Betamethasone valerate	13091212	8
Caelo	Betamethasone valerate	13091207	8
Gehe 13.02.14	Betamethasone valerate	13091210	3
Caelo	Betamethasone valerate	13091213	6
Phönix Gotha	Betamethasone valerate	13091213	1
Euro OTC	Betamethasone valerate	1311039	1
Euro OTC	Betamethasone valerate	1311039-01	17
Euro OTC	Betamethasone valerate	131103901	1
Fagron	Betamethasone valerate	1311039-01	1
Noveda	Betamethasone valerate	1311039-01	1
Euro OTC	Betamethasone valerate	131139-01	1
Caelo	Betamethasone valerate	13225502	3
Caelo	Betamethasone valerate	13225503	8
GEHE 17.06.2014	Betamethasone valerate	13225503	1
Caelo	Betamethasone valerate	13225504	5
Caesar & Loretz GmbH	Betamethasone valerate	13225504	1
Caelo	Betamethasone valerate	13225505	6
Caelo	Betamethasone valerate	13225508	8
Caelo	Betamethasone valerate	13225507	2
Ichthyol/Gehe	Betamethasone valerate	13225508	2
Phoenix Goettin	Betamethasone valerate	13225508	1
Hustadt Apotheke	Betamethasone valerate	13225508	1
Caelo	Betamethasone valerate	13225509	2
Caelo	Betamethasone valerate	13225515	7
Caelo	Betamethasone valerate	13225516	5
AHDE / Cael 17.02.2015	Betamethasone valerate	13225516	1
Fagron	Betamethasone valerate	13D03-N07	45

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	13G19-N01	46
Herbasinica	Betamethasone valerate	13g19-n01	1
Caelo	Betamethasone valerate	13G19-N01	2
Fagron	Betamethasone valerate	13g19-n01	2
Hirsch	Betamethasone valerate	13G19-No1	1
Fagron	Betamethasone valerate	13K05-B08-292647	3
Fagron	Betamethasone valerate	13K05-B08	3
Fagron	Betamethasone valerate	13K05-B08-092652	1
Fagron	Betamethasone valerate	13K05-B08-292652	1
Fagron	Betamethasone valerate	13K29-B32	4
Fagron	Betamethasone valerate	13K29-B12-288247	1
Fagron	Betamethasone valerate	13K29-B32-288244	1
Fagron	Betamethasone valerate	13K29B32288243	1
Fagron	Betamethasone valerate	13K29-B32-28824	1
Fagron	Betamethasone valerate	13K29-B32-288245	1
Fagron	Betamethasone valerate	13K29-B32-288246	3
Fagron	Betamethasone valerate	13K29-B32-288247	15
Ichthyol-Gesellschaft	Betamethasone valerate	13k29-B32-288247	1
Caelo	Betamethasone valerate	13K29-B32-288247	1
Caelo	Betamethasone valerate	13K29B32288247	1
Fagron	Betamethasone valerate	13k29b32288247	1
Fagron	Betamethasone valerate	13K29-B32-288248	3
Fagron	Betamethasone valerate	13K29-B32-288250	3
Fargon	Betamethasone valerate	13k29-b32-289364	1
Fagron	Betamethasone valerate	13117-B08-292649	2
Euro OTC	Betamethasone valerate	1406019-01	18
Caelo	Betamethasone valerate	14031407	1
Euro OTC	Betamethasone valerate	140601901	1
noweda	Betamethasone valerate	1406019-01	1
Euro OTC	Betamethasone valerate	1406019-02	14
AHD	Betamethasone valerate	1406019-02	2
Euro OTC	Betamethasone valerate	140601902	1
EuRho	Betamethasone valerate	1406019-02	1
Caelo	Betamethasone valerate	1406019-02	1
Euro OTC	Betamethasone valerate	1406019-03	12
Euro OTC	Betamethasone valerate	140601903	1
Caelo	Betamethasone valerate	1406019-03	1
Euroo	Betamethasone valerate	1406019-03	1
Caelo	Betamethasone valerate	140601903	1
Caelo	Betamethasone valerate	14188602	1
Noweda	Betamethasone valerate	1406019-03	1
Caelo	Betamethasone valerate	14188604	7
Caelo	Betamethasone valerate	14188603	2
Caelo	Betamethasone valerate	14188608	2
Phönix Gotha	Betamethasone valerate	14188608	1
Caelo	Betamethasone valerate	14188609	1
Caelo	Betamethasone valerate	14188610	3
caesar&loretz,phönix	Betamethasone valerate	14188606	1
Caelo	Betamethasone valerate	14188617	1
Caelo	Betamethasone valerate	14188619	2
Alliance Healthcare	Betamethasone valerate	146019-02	1
Fagron	Betamethasone valerate	14C19-B02-292653	6
Fagron	Betamethasone valerate	14C19-B02-292650	2
Fagron	Betamethasone valerate	14c19-b02-292650	1
Fagron	Betamethasone valerate	14C19-B02-292646	1
Fagron	Betamethasone valerate	14C19B02	1
Fagron	Betamethasone valerate	14C19-B02-292648	1
Fagron	Betamethasone valerate	14C19-B02-296168	2
Fagron	Betamethasone valerate	14C19-B02-2926550	1
Fagron	Betamethasone valerate	14C19-B02-296169	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	14C19-B02-292653	1
Fagron	Betamethasone valerate	14G30-B05	3
Fagron	Betamethasone valerate	14G30-B05-296172	2
Fagron	Betamethasone valerate	14G30-B05-296173	6
Fagron	Betamethasone valerate	14G30-B05-296175	1
Fagron	Betamethasone valerate	14H28-B01	3
Fagron	Betamethasone valerate	14G30B05309519	1
Fagron	Betamethasone valerate	14G30-B05-309520	2
Fagron	Betamethasone valerate	14H28B01	1
Fagron	Betamethasone valerate	14H28-B01-302683	1
Fagron	Betamethasone valerate	14G30-B05-309521	1
Fagron	Betamethasone valerate	14G30-B05-309518	1
Fagron	Betamethasone valerate	14H28-B01-302863	2
Fagron	Betamethasone valerate	14H28-B01-302864	2
Fagron	Betamethasone valerate	14H28-B01-302865	9
Caelo	Betamethasone valerate	14H28-B01-302865	1
Fagron	Betamethasone valerate	14h28-b01-302865	2
Fagron	Betamethasone valerate	14H28-B01-302866	3
Fagron	Betamethasone valerate	14H28-b01-302866	1
Fagron	Betamethasone valerate	14H28-B01-302877	2
Hedinger	Betamethasone valerate	14H28-B01-302877	1
Fagron	Betamethasone valerate	14H28-B01-305470	1
AHD/Fargon	Betamethasone valerate	14H28-Bo1-302865	1
Fagron	Betamethasone valerate	15/16-B07317428	1
Ebert u. Jacobi 16.0...	Betamethasone valerate	15/16-B07-317417	1
Fagron	Betamethasone valerate	15/16-B07-317417	1
Caelo	Betamethasone valerate	15/16-B07-319228	1
Fagron	Betamethasone valerate	15/16-B07-317428	1
Allianz Healthcare 27.0...	Betamethasone valerate	15075802	1
Caelo	Betamethasone valerate	15075802	12
Caesar&Loretz GmbH/Anzag	Betamethasone valerate	15075802	1
Fagron	Betamethasone valerate	15075802	1
Caelo	Betamethasone valerate	15075803	4
Caelo	Betamethasone valerate	150758036	1
Caelo	Betamethasone valerate	15075804	5
Caelo	Betamethasone valerate	15075805	2
Caelo	Betamethasone valerate	15075809	1
Caelo	Betamethasone valerate	15075810	3
Euro OTC	Betamethasone valerate	1510037-01	8
Bombastus	Betamethasone valerate	1510037-01	1
Noweda	Betamethasone valerate	15075812	1
Caelo	Betamethasone valerate	15075812	2
Euro/Alliance Healthcare	Betamethasone valerate	1510037-01	1
Caelo	Betamethasone valerate	1510037-01	1
Fagron	Betamethasone valerate	1516-B07-317417	1
Caelo	Betamethasone valerate	15262602	2
Caelo	Betamethasone valerate	15262603	8
Caelo	Betamethasone valerate	15262604	5
Caelo	Betamethasone valerate	15262606	1
Caelo	Betamethasone valerate	15262607	6
Caelo	Betamethasone valerate	15262609	2
Caelo	Betamethasone valerate	15398501	5
Gehe	Betamethasone valerate	15398501	1
Caelo	Betamethasone valerate	15398505	2
Caelo	Betamethasone valerate	15398506	5
Caelo	Betamethasone valerate	15398515	3
Fagron	Betamethasone valerate	15824-B04	1
Caelo	Betamethasone valerate	15B24-B04	1
Fagron	Betamethasone valerate	15B24-B04-307016	5
Caelo	Betamethasone valerate	15B24-B04-307016	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Betamethasone valerate	15B24-B04-307015	1
Fagron	Betamethasone valerate	15B24-B04	1
Fagron	Betamethasone valerate	15F16-B04	1
Fagron	Betamethasone valerate	15F16-B04-314054	1
Fagron	Betamethasone valerate	15F16-B04-314882	1
Fagron	Betamethasone valerate	15F16-B04-315328	1
Fagron	Betamethasone valerate	15I16-B07-317417	1
Fagron	Betamethasone valerate	15I16-B07	1
Fagron	Betamethasone valerate	15I16-B07-319832	1
Euro OTC	Betamethasone valerate	1606023-01	3
Fagron	Betamethasone valerate	16B18-B02-322111	1
Caelo	Betamethasone valerate	16B18-B02-320971	1
Euro OTC	Betamethasone valerate	1610010-01	1
Fagron	Betamethasone valerate	16B18-B02-320971	2
Caelo	Betamethasone valerate	16270501	1
Caelo	Betamethasone valerate	18071403	1
Gehe	Betamethasone valerate	1712E-01181	1
Fagron	Betamethasone valerate	16B18-B02-323034	1
Fagron	Betamethasone valerate	2186	1
Euro OTC	Betamethasone valerate	2014Q1181	1
Fagron	Betamethasone valerate	292652	1
Fagron	Betamethasone valerate	700103-0004	1
Fagron	Betamethasone valerate	BV036/1215	1
Fagron	Betamethasone valerate	BV-BLT225/0514	1
Fagron	Betamethasone valerate	BV019/0514	1
Fragron	Betamethasone valerate	BV-BLT225/0514	2
Caelo	Betamethasone valerate	C0073/1	3
Oberlinden Apotheke	Betamethasone valerate	C0073/115040	3
Sanacorp	Betamethasone valerate		1
Caelo	Betamethasone valerate	NT0597M	1
Fagron	Betamethasone valerate	NT0597M	2
Caelo	Betamethasone valerate	10296701	1
Fagron	Betamethasone valerate	612211181	1
Caelo	Betamethasone valerate	10296705	2
Euro OTC	Betamethasone valerate	1108045-01	3
Euro OTC	Betamethasone valerate	110804-02	1
Euro OTC	Betamethasone valerate	1108045-03	14
Kehr	Betamethasone valerate	1108045-03	1
Euro/Gehe	Betamethasone valerate	1108045-02	1
Noweda	Betamethasone valerate	11131902	1
Caelo	Betamethasone valerate	1113	1
Caelo	Betamethasone valerate	11131905	1
Caelo	Betamethasone valerate	11131906	2
Caelo	Betamethasone valerate	11131917	4
Caesar & Loretz GmbH, 4. .	Betamethasone valerate	11131914	3
Caelo	Betamethasone valerate	1131914	1
Caelo	Betamethasone valerate	11131909	1
Caesar &Loretz GmbH	Betamethasone valerate	11131917	1
Caelo	Betamethasone valerate	11131914	2
Noweda	Betamethasone valerate	11K18-N09	1
Fagron	Betamethasone valerate	11K18-N09	4
Phönix Gotha	Betamethasone valerate	12003403	1
Gehe	Betamethasone valerate	12003403	2
Caesar & Loretz GmbH, 4. .	Betamethasone valerate	12003404	1
Caelo	Betamethasone valerate	12003404	2
Caelo	Betamethasone valerate	12003405	8
Phönix Gotha	Betamethasone valerate	12003405	1
Anzag 24.10.12	Betamethasone valerate	12003405	1
Caelo	Betamethasone valerate	12003406	7
Caelo	Betamethasone valerate	12003407	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Betamethasone valerate	12003409	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	12003409	2
Phoenix	Betamethasone valerate	12003409	2
Caelo	Betamethasone valerate	12003409	2
Caelo	Betamethasone valerate	12003410	2
Caelo	Betamethasone valerate	12003411	4
vdl	Betamethasone valerate	12003411	1
Kehr	Betamethasone valerate	1208014-01	1
Euro OTC	Betamethasone valerate	1208014-01	16
Euro OTC	Betamethasone valerate	120801401	1
Caelo	Betamethasone valerate	120801401	1
Noweda	Betamethasone valerate	1208014-02	2
Euro OTC	Betamethasone valerate	1208014-02	10
GEHE	Betamethasone valerate	1208014-02	1
Euro OTC	Betamethasone valerate	120801402	2
Fagron	Betamethasone valerate	120801402	1
Euro OTC	Betamethasone valerate	120801404	1
Euro OTC	Betamethasone valerate	120812-02	1
Caelo	Betamethasone valerate	12229802	5
Caelo	Betamethasone valerate	12229804	4
Gehe	Betamethasone valerate	12229804	1
Caelo	Betamethasone valerate	12229805	10
Caelo	Betamethasone valerate	12229806	7
Phönix	Betamethasone valerate	12229807	1
Caelo	Betamethasone valerate	12229808	10
Caelo	Betamethasone valerate	12229809	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	12229809	1
Ph.Eur.7,0	Betamethasone valerate	12229808	1
Phönix Gotha	Betamethasone valerate	12229808	1
Caelo	Betamethasone valerate	12229810	3
Gehe	Betamethasone valerate	12229809	1
Caelo	Betamethasone valerate	12229811	7
Caelo	Betamethasone valerate	12229812	12
GEHE	Betamethasone valerate	12229813	1
Caelo	Betamethasone valerate	12229813	2
Fagron	Betamethasone valerate	12B28-N01	9
Großhandel	Betamethasone valerate	12B028-N01	1
Noweda	Betamethasone valerate	12229832	1
Noweda	Betamethasone valerate	12B28-N01	2
phönix, 12.12.12	Betamethasone valerate	12B28-N01	4
FARGON	Betamethasone valerate	12g09-n07	2
Fagron	Betamethasone valerate	12G09-N07	25
Caelo	Betamethasone valerate	12G09-N07	2
Sanacorp	Betamethasone valerate	12G09-N07	1
Noweda	Betamethasone valerate	12G09-N07	4
AHC 01.07.13 EK 48,05	Betamethasone valerate	12K07-N23	1
Caelo	Betamethasone valerate	12L11-N01	3
Bombastus	Betamethasone valerate	12L11-N01	1
Ginkgo-Apotheke	Betamethasone valerate	12L11-N01	1
Caelo	Betamethasone valerate	13091204	5
Phönix	Betamethasone valerate	13091201	2
Alliance Health 06.02.2...	Betamethasone valerate	13091207	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	13091206	2
Caelo	Betamethasone valerate	13091210	3
Caesar & Loretz GmbH, 4...	Betamethasone valerate	13091211	1
Caelo	Betamethasone valerate	13091211	2
Euro OTC	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	13d03-n07	3
Phönix	Betamethasone valerate	13D03-N07	1
Großhandel	Betamethasone valerate	13D03-N07	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	13D03-N07	4
Fagron	Betamethasone valerate	13K29B32	1
Fagron	Betamethasone valerate	13G19-N01	1
Fagron	Betamethasone valerate	14G30-B05-29617	1
Phonix	Betamethasone valerate	13K29-B32	1
Caelo	Betamethasone valerate	18121206	1
Euro OTC	Betamethasone valerate	2507211181	1
Fagron	Betamethasone valerate	2B28-N01	1
Fagron	Betamethasone valerate	20101012-1	1
Caelo	Betamethasone valerate	2x12229813	1
Sanacorp	Betamethasone valerate	30051201	1
Caelo	Betamethasone valerate	3110031	1
Caelo	Betamethasone valerate	B03041205	1
Fiebig 27.06.13 EK47,81	Betamethasone valerate	B9/131	1
Fagron	Betamethasone valerate	NS2072M	2
Fagron	Betamethasone valerate	NS0706M	2
Anzag	Betamethasone valerate	11K18N09	1
Euro OTC	Betamethasone valerate	1108045-02	3
Holdermann	Betamethasone valerate	1208014-01	1
Holdermann	Betamethasone valerate	120801402	1
Gehe	Betamethasone valerate	1208014-04	1
Gehe	Betamethasone valerate	1311039-01	2
Eigenherstellung	Betamethasone valerate	9070313	1
Fagron	Betamethasone valerate	1208014-01	1
Caelo	Betamethasone valerate	1203403	1
Euro OTC	Betamethasone valerate	120801403	1
A.H.D.	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	90616-2	1
Caelo	Betamethasone valerate	210112	1
PHOENIX am 05.07.2012	Betamethasone valerate	1008012-03	1
Caesar & Loretz GmbH, 4...	Betamethasone valerate	10296707	1
Caesar & Loretz GmbH 40...	Betamethasone valerate	10296715	1
Kehr	Betamethasone valerate	1108045-01	1
Noweda	Betamethasone valerate	1108045-01	1
Anzag am 24.04.2012	Betamethasone valerate	1108045-01	1
Phönix Gotha	Betamethasone valerate	1108045-02	1
Phoenix 23.08.2012	Betamethasone valerate	1108045-03	2
Euro OTC	Betamethasone valerate	110804503	1
Noweda	Betamethasone valerate	11B21-N02	1
anzag am 29.06.2012	Betamethasone valerate	11E18-N03	1
Fagron	Betamethasone valerate	11k18-n09	1
Caelo	Betamethasone valerate	12003402	1
Caelo	Betamethasone valerate	1208014-01	1
Noweda	Betamethasone valerate	1208014-01	1
EuRho	Betamethasone valerate	1208014-02	1
Caelo	Betamethasone valerate	1208014-03	1
noweda	Betamethasone valerate	1208014-04	1
Fiebig ek: 45,65EUR	Betamethasone valerate	12B28-N01	1
	Betamethasone valerate	1208014-04	1
Caelo	Betamethasone valerate	12B28-N01	2
FARGON	Betamethasone valerate	12b28-n01	1
agron/Krieger	Betamethasone valerate	12B2B-N01	1
Großhandel	Betamethasone valerate	12G09-N07	1
Caelo	Betamethasone valerate	12g09-n07	1
AHD,09.04.2013	Betamethasone valerate	12G09-N07	1
FARGON	Betamethasone valerate	12111-n01	1
Anzag	Betamethasone valerate	12L11-N01	1
Caelo	Betamethasone valerate	13091201	1
Euro OTC	Betamethasone valerate	12L11-N01	1
Noweda	Betamethasone valerate	13091203	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Betamethasone valerate	13091206	1
Caelo	Betamethasone valerate	13091209	4
Caesar&Loretz GmbH/Anzag	Betamethasone valerate	13091210	1
Phönix	Betamethasone valerate	13091212	2
Gehe	Betamethasone valerate	13091211	1
Sanacorp	Betamethasone valerate	13091210	1
Alliance healthcare	Betamethasone valerate	13D03-N07	1
Fagron	Betamethasone valerate	13G19N01	1
Symbiotica	Betamethasone valerate	14H28B01302863	1
Euro OTC	Betamethasone valerate	3313U-01181	1
Caelo	Betamethasone valerate	3110025	1
Phönix	Betamethasone valerate	BV-BLT186/0512	1
Fagron	Betamethasone valerate	NP1351M	1
Fagron	Betamethasone valerate	NR1545M	1

- 55 033 spectra from 335 *Apo-Ident* customers from a total of 20 373 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	409	0	75 469
Type B	0	214	0	81 134
Type C	0	946	22	55 033

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5330 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.1963 %)
Type C	100.0000 % (> 99.8622 %)	97.7273 % (> 97.4174 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20026	20026	0.00	23.76
20887	22249	7.65	27.64
20920	22861	5.94	31.19
21215	22249	4.51	30.40
21566	22249	7.24	29.59
21588	20026	11.72	23.91
21645	22249	5.93	26.88
21674	21674	0.00	26.97
22249	22249	0.00	29.02
22861	22861	0.00	31.26

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Betamethasone, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20943-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Betamethasone, micronized; Betamethasonum, micronisatum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Betamethasone, m...	12D26-N08	20943	40	1402096
Fagron	Betamethasone, m...	13H08-N06	21579	40	1411037
Fagron	Betamethasone, m...	11H31-B06-288219	22493	40	1608324

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Betamethasone, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 160 spectra of 5 reference samples from the substance/substance group *Betamethasone, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Betamethasone, micronized	11B18-N14	20271	30
Fagron	Betamethasone, micronized	11B18-N14	20276	30
Fagron	Betamethasone, micronized	13H08-N06	21579 [†]	20
Fagron	Betamethasone, micronized	14C13-B02-296165	22897	40
Fagron	Betamethasone, micronized	15L09-B05-324091	22904	40

- 81 188 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 33 spectra from 21 *Apo-Ident* customers from 22 batches from the substance/substance group *Betamethasone, micronized*.

[†]These spectra were recorded from 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
Fagron	Betamethasone, micronized	11H31-B06-288217	1
Fagron	Betamethasone, micronized	12J01-N02	2
Fagron	Betamethasone, micronized	14C13-B02	2
Symbiotec Pharmed Lab Ltd. . .	Betamethasone, micronized	14C13-B02	1
Fagron	Betamethasone, micronized	14C13-B02-296154	1
Fagron	Betamethasone, micronized	14C13-B02-296164	3
Fagron	Betamethasone, micronized	14C13-B02-305561	1
Fagron	Betamethasone, micronized	14c13-bo2-305561	1
BASF/Phönix	Betamethasone, micronized	ZBtBY13004	1
Fagron	Betamethasone, micronized	9071304	1
Fagron	Betamethasone, micronized	9K25-N13	1
Caelo	Betamethasone, micronized	11/14-N02	1
Fagron	Betamethasone, micronized	11/14-N02	1
Fagron	Betamethasone, micronized	9J26-N08	1
Noweda	Betamethasone, micronized	12B20-N05	1
Gehe 07.10.13	Betamethasone, micronized	1201-No2	1
Anzag 5.06.2012	Betamethasone, micronized	11K14-N02	1
Caelo	Betamethasone, micronized	120104/13	1
Fagron	Betamethasone, micronized	12B20-N05	2
Phönix	Betamethasone, micronized	12B20-N05	1
Fagron	Betamethasone, micronized	12D26N08	1
Anzag 13.06.2013	Betamethasone, micronized	12B20-N05	1
Fiebig	Betamethasone, micronized	12J01-120301-m1	1
Fagron	Betamethasone, micronized	12D26-N08	1
gehe 11.06.2013	Betamethasone, micronized	M-X01-111201-m1	1
Noweda	Betamethasone, micronized	M-X01-120301m1	1
Unisan	Betamethasone, micronized	Retest09K25-N13	1
GEHE	Betamethasone, micronized	11/14-N02	1

- 55 968 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	149	11	81 188
Type C	0	21	12	55 968

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	93.1250 % (> 91.2500 %)
Type C	100.0000 % (> 99.8622 %)	63.6364 % (> 54.5455 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20943	20943	0.00	16.18
21579	21579	0.00	17.19
22493	22493	0.00	14.03

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Bifonazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20810-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bifonazole; Bifonazolum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Bifonazole	1206027-01	20810	40	1312397
Fagron	Bifonazole	12G11-N09	20820	40	20120807
Euro OTC	Bifonazole	1401031-01	21631	40	20140220
Euro OTC	Bifonazole	1510001	22253	40	20151203*
Caelo	Bifonazole	15152701	22906	40	20150703
Caelo	Bifonazole	15152702	22907	40	20150703
Fagron	Bifonazole	16D07-B10-324381	22941	40	20160419

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Bifonazole*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Bifonazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Bifonazole	11A13-N13	20274	30
Euro OTC	Bifonazole	1401031-01	21631 [†]	20
Euro OTC	Bifonazole	1510001	22253 [†]	20
Caelo	Bifonazole	15152702	22955	40
Euro OTC	Bifonazole	1510001	22253SI	60

- 81 178 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 30 spectra from 15 *Apo-Ident* customers from 18 batches from the substance/substance group *Bifonazole*.

Supplier	Substance	Batch	Spectra
Euro OTC	Bifonazole	1206027-01	2
Fagron	Bifonazole	11071202	1
Fagron	Bifonazole	11F20-N06	1
Euro OTC	Bifonazole	1206027-02	1
Fagron	Bifonazole	12E29-N03	3
Fagron	Bifonazole	12G11-N09	2
Euro OTC	Bifonazole	13G10N02	1
Fagron	Bifonazole	13G10-N02	1
Fagron	Bifonazole	14C28-B03-292388	1
Fagron	Bifonazole	14K10-B01-300541	4
Fagron	Bifonazole	14K10-B01-306783	3
Fagron	Bifonazole	14K10-B01-308349	1
Euro OTC	Bifonazole	1510001-02	3
Fagron	Bifonazole	14K10-B01-312067	1
Caelo	Bifonazole	15152701	2
Fagron	Bifonazole	16D07-B10-324380	1
Fagron	Bifonazole	16D07-B10-32480	1
Fargon	Bifonazole	14k10-b01-300541	1

- 55 971 spectra from 335 *Apo-Ident* customers from a total of 20 594 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	170	0	81 178
Type C	0	30	0	55 971

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 80.0000 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20810	20810	0.00	39.04
20820	22253	7.30	36.89
21631	22253	3.84	43.14
22253	22253	0.00	40.81
22906	22253	4.97	39.02
22907	22253	6.35	39.28
22941	22253	5.32	39.04

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Biotin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20414-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Biotin; Biotinum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Biotin	10I17-N08	20414	40	AR-12-FG-008445-01
Fagron	Biotin	13K29-N02	21221	40	20131204
Euro OTC	Biotin	1402028-01	21632	40	20140404
Euro OTC	Biotin	1508030	21904	40	20150925*
Euro OTC	Biotin	1610003	22855	40	20161110*
Caelo	Biotin	16164313	22902	40	20160216

Validation samples

A total of 213 227 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 *Biotin*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Biotin	1402028-01	21632 [†]	20
Euro OTC	Biotin	1508030	21904 [†]	20
Euro OTC	Biotin	1603017	22507	40
Caelo	Biotin	16164313	22901	40
Caelo	Biotin	163432	23029	40
Caelo	Biotin	163432	23063	40

- 81 148 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 28 spectra from 12 *Apo-Ident* customers from 19 batches from the substance/substance group *Biotin*.

Supplier	Substance	Batch	Spectra
Euro OTC	Biotin	1111039-02	2
Caelo	Biotin	12A23-N03	1
EuRho	Biotin	111039-01	1
Euro OTC	Biotin	3021501	1
Euro OTC	Biotin	1111039-03	1
Euro OTC	Biotin	2041517	1
Fagron	Biotin	12111302	1
Fagron	Biotin	12C14-N01	2
Fagron	Biotin	12A23-N03	1
Euro OTC	Biotin	1301026-01	3
Euro OTC	Biotin	1402028-01	3
Fagron	Biotin	13K29-N02	3
Fagron	Biotin	14d04-b07-292963	1
Euro OTC	Biotin	1411047-01	1
Euro OTC	Biotin	28071506	1
Fagron	Biotin	13081203	1
Euro OTC	Biotin	1111039-01	1
Fagron	Biotin	1017-N08	1
Fagron	Biotin	13111202	1
Fagron	Biotin	20110634	1

- 55 973 spectra from 335 *Apo-Ident* customers from a total of 20 592 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	200	0	81 148
Type C	0	28	0	55 973

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 78.5714 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20414	20414	0.00	58.50
21221	21904	7.24	61.46
21632	21904	3.07	57.35
21904	21904	0.00	57.52
22855	22855	0.00	57.47
22902	21904	4.43	56.27

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Bismuth gallath, basic**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21252-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Bismuth gallath, basic; Bismuthi subgallas; Bismutum subgallicum

Special notes

When selecting the *Bismuth gallath, basic* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Bismuth gallath,...	13179105	21252	40	1412254
Caelo	Bismuth gallath,...	13179105	21553	40	20130701
Fagron	Bismuth gallath,...	15B02-B04-309481	22597	40	20150226

Validation samples

A total of 213 227 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 *Bismuth gallath, basic*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 100 spectra of 3 reference samples from the substance/substance group *Bismuth gallath, basic*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Bismuth gallath, basic	pending	20466	40
Caelo	Bismuth gallath, basic	13179105	21553 [†]	20
Fagron	Bismuth gallath, basic	15J26-B02-317883	22598	40

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 155 spectra from 91 *Apo-Ident* customers from 74 batches from the substance/substance group *Bismuth gallath, basic*.

Supplier	Substance	Batch	Spectra
siehe WE-Prüfprotokoll	Bismuth gallath, basic	4/09	1
Caelo	Bismuth gallath, basic	12172409	6

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Bismuth gallath, basic	12172402	4
Fagron	Bismuth gallath, basic	13/18-B13294098	1
Fagron	Bismuth gallath, basic	12C13-N03	4
sanacorp	Bismuth gallath, basic	13/1818B13-292057	1
Fagron	Bismuth gallath, basic	13/18-B13-292058	2
Bombastus	Bismuth gallath, basic	13/18-B13-292058	1
Fagron	Bismuth gallath, basic	13/18-B-13-292057	1
Fagron	Bismuth gallath, basic	13/18-B13-294108	1
Caelo	Bismuth gallath, basic	13/18-B13-292058	1
Caelo	Bismuth gallath, basic	13179101	1
Caelo	Bismuth gallath, basic	13179105	1
Fagron	Bismuth gallath, basic	13179111	1
Caelo	Bismuth gallath, basic	13179111	6
Fagron	Bismuth gallath, basic	1318b13292058	1
Fagron	Bismuth gallath, basic		1
Fagron	Bismuth gallath, basic	1318-b13-292058	1
ahd/lamotte	Bismuth gallath, basic	13718b13292058	1
Fagron	Bismuth gallath, basic	1318B13294108	1
Fagron	Bismuth gallath, basic	13G10-N12	4
Fagron	Bismuth gallath, basic	13I18-B13	4
Infectopharm	Bismuth gallath, basic	14224103	1
Fagron	Bismuth gallath, basic	13I18-B13-294108	3
Fagron	Bismuth gallath, basic	13K08-N03	3
Caelo	Bismuth gallath, basic	14224103	3
Fagron	Bismuth gallath, basic	14H13B07303639	1
Fagron	Bismuth gallath, basic	14H13-B07-303639	2
Caelo	Bismuth gallath, basic	15080602	2
Fagron	Bismuth gallath, basic	15/26-B02-320473	1
Alliance H.	Bismuth gallath, basic	15080602	1
Caelo	Bismuth gallath, basic	15080603	1
Caelo	Bismuth gallath, basic	15080606	4
Caelo	Bismuth gallath, basic	1520910	1
Caelo	Bismuth gallath, basic	15200904	2
Caelo	Bismuth gallath, basic	15B02B04304413	1
Caelo	Bismuth gallath, basic	15200905	1
Caelo	Bismuth gallath, basic	15B02-B04-309481	1
Fagron	Bismuth gallath, basic	15J26-B02-321313	3
Fagron	Bismuth gallath, basic	15J26-B02-317883	3
Fagron	Bismuth gallath, basic	15B02-B04-304413	2
Fagron	Bismuth gallath, basic	15H05-B07	1
Caelo	Bismuth gallath, basic	16038308	2
Fargon/ Noweda	Bismuth gallath, basic	15B02-B04-309481	1
Caesar & Loretz GmbH Hi...	Bismuth gallath, basic	16038308	1
Fagron	Bismuth gallath, basic	2012006724	2
Caelo	Bismuth gallath, basic	23121410	1
Caelo	Bismuth gallath, basic	2414E-01185	1
Caelo	Bismuth gallath, basic	81297468	5
Caelo	Bismuth gallath, basic	9205701	1
Caelo	Bismuth gallath, basic	9205703	1
Caelo	Bismuth gallath, basic	10D23-N05	1
Fagron	Bismuth gallath, basic	10H31-N01	1
Phoenix, Jembke	Bismuth gallath, basic	10135101	1
Caelo	Bismuth gallath, basic	1127203	1
Fagron	Bismuth gallath, basic	11F15-N03	1
Caelo	Bismuth gallath, basic	1217240	1
Fagron	Bismuth gallath, basic	12/13-N11	1
Phönix	Bismuth gallath, basic	12-13-N11	1
Caelo	Bismuth gallath, basic	12166901	2
Gehe	Bismuth gallath, basic	12172401	1
Caelo	Bismuth gallath, basic	12172401	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Sanacorp	Bismuth gallath, basic	12/13-N11	1
Alliance	Bismuth gallath, basic	12172402	1
Caelo	Bismuth gallath, basic	12c13-n03	1
Caelo	Bismuth gallath, basic	12c13-no3	1
Klenk	Bismuth gallath, basic	12E16-N03	1
Anzag	Bismuth gallath, basic	12e16-n03	1
Caelo	Bismuth gallath, basic	12E16-N03	1
Phönix	Bismuth gallath, basic	12E16-N03	1
Fagron	Bismuth gallath, basic	12K26-N01	4
Fagron	Bismuth gallath, basic	12E16-N03	1
Sanacorp	Bismuth gallath, basic	13D19-N02	1
Caelo	Bismuth gallath, basic	13D19-N02	2
Fagron	Bismuth gallath, basic	13D19-N02	5
Apomix/Noweda	Bismuth gallath, basic	13D19-N02	1
Alliance Healthcare	Bismuth gallath, basic	13D19-N02	2
Fagron	Bismuth gallath, basic	13E21-N03	2
Fagron	Bismuth gallath, basic	2010002685	2
Fagron	Bismuth gallath, basic	2012000059	3
Anzag	Bismuth gallath, basic	2012000059	2
Fagron	Bismuth gallath, basic	2015005560	1
PHOENIX am 17.01.2014	Bismuth gallath, basic	2012006724	1
Fagron	Bismuth gallath, basic	411092-3-P	1
Caelo	Bismuth gallath, basic	5208I-01185	1
Caelo	Bismuth gallath, basic	8129768	1
Caelo	Bismuth gallath, basic	B-150513-1	1
Caelo	Bismuth gallath, basic	92057409	1
Fargon	Bismuth gallath, basic	13/18-B13-294108	1
Fagron	Bismuth gallath, basic	14H13-B07	1
Fagron	Bismuth gallath, basic	15B02-B04-309481	1
Martinus Apotheke	Bismuth gallath, basic	keine	1
Fagron	Bismuth gallath, basic	13I18-B13-292058	1
Fagron	Bismuth gallath, basic	13i18-b13-294108	1

- 55 846 spectra from 335 *Apo-Ident* customers from a total of 20 538 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	116	4	75 758
Type B	0	47	53	81 248
Type C	0	138	17	55 846

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	96.6667 % (> 94.1667 %)
Type B	100.0000 % (> 99.9853 %)	47.0000 % (> 44.0000 %)
Type C	100.0000 % (> 99.8622 %)	89.0323 % (> 87.0968 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21252	21252	0.00	140.93
21553	21252	7.44	141.74
22597	21252	9.87	141.49

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Boric acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20182-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Boric acid; Acidum boricum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Boric acid	09L21-N08	20182	40	AR-12-FG-002702-01
Fagron	Boric acid	13I04-N06	21228	40	20130920
Caelo	Boric acid	14133119	21804	40	20140509
Caelo	Boric acid	15425112	22964	40	20160104

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Boric acid*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 70 spectra of 3 reference samples from the substance/substance group *Boric acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Boric acid	9L21-N08	20182 [†]	10
Caelo	Boric acid	14133119	21804 [†]	20
Caelo	Boric acid	15242903	22965	40

- 81 278 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 17 *Apo-Ident* customers from 24 batches from the substance/substance group *Boric acid*.

Supplier	Substance	Batch	Spectra
Caelo	Boric acid	9324021	1
Caelo	Boric acid	2808A-01019	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
Fagron	Boric acid	13I04-N06	2
Caelo	Boric acid	14133119	1
Caelo	Boric acid	15095103	1
Sanacorp	Boric acid	1/AKD3	1
Caelo	Boric acid	10227913	1
Caelo	Boric acid	812Q-01018	1
Caelo	Boric acid	11D13-N08	1
Caelo	Boric acid	14095202	1
Caelo	Boric acid	12260537	1
Fagron	Boric acid	14133101	1
Fagron	Boric acid	14B07-B02-295752	1
Caelo	Boric acid	15425101	1
Caelo	Boric acid	9324036	1
Caelo	Boric acid	9324043	1
Caelo	Boric acid	14133113	1
Caelo	Boric acid	12238901	1
Nachprüfung	Boric acid		1
Caelo	Boric acid	12260502	1
Fagron	Boric acid	11d13-n08	1
Caelo	Boric acid	12260507	1
Caelo	Boric acid	1234	1
Fagron	Boric acid	12f01-n08	1

- 55 976 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	70	0	81 278
Type C	0	25	0	55 976

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 91.4286 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 76.0000 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20182	20182	0.00	52.14
21228	20182	10.84	52.11
21804	20182	13.32	52.06
22964	20182	7.53	51.77

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Budesonide, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20569-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Budesonide, micronized; Budesonidum micronisatum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Budesonide, micr...	11351706	20569	40	1312398
Caelo	Budesonide, micr...	11351704	20808	30	AR-15-FG-005286-01
Euro OTC	Budesonide, micr...	1311022-01	21620	40	20140113
Euro OTC	Budesonide, micr...	1604018	22537	40	20160509*
Caelo	Budesonide, micr...	161431	22627	40	20160606*
Caelo	Budesonide, micr...	15344004	22649	40	20151116

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Budesonide, micr...	16J04-B01-326581	22888	40	20161026
Euro OTC	Budesonide, micr...	1311022-01	21620SI	25	20140113
Euro OTC	Budesonide, micr...	1604018	22537SI	23	20160509*
Caelo	Budesonide, micr...	161431	22627SI	25	20160606*
Caelo	Budesonide, micr...	15344004	22649SI	30	20151116
Fagron	Budesonide, micr...	16J04-B01-326581	22888SI	30	20161026

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 403 spectra of 12 reference samples from the substance/substance group *Budesonide, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 475 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 136 spectra of 5 reference samples from the substance/substance group *Budesonide, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Budesonide, micronized	11351706	20800	40
Euro OTC	Budesonide, micronized	1311022-01	21620 [†]	20
Fagron	Budesonide, micronized	16J04-B01-326581	22841	40
Euro OTC	Budesonide, micronized	1311022-01	21620SI [†]	12
Fagron	Budesonide, micronized	16J04-B01-326581	22841SI	24

- 81 212 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

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

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

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

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 98 spectra from 36 *Apo-Ident* customers from 52 batches from the substance/substance group *Budesonide, micronized*.

Supplier	Substance	Batch	Spectra
Caelo	Budesonide, micronized	12295105	1
Caelo	Budesonide, micronized	12295106	2
Caelo	Budesonide, micronized	12295109	2
Caelo	Budesonide, micronized	12295111	5
Caelo	Budesonide, micronized	12295110	2
Caelo	Budesonide, micronized	12295108	1
Caelo	Budesonide, micronized	1305004-01	2
Euro OTC	Budesonide, micronized	1311022-01	2
Caelo	Budesonide, micronized	140711707	1
Fagron	Budesonide, micronized	13H22-N03	3
sanacorp	Budesonide, micronized	14071701	1
Caelo	Budesonide, micronized	14071702	6
Fagron	Budesonide, micronized	13A07-N09	2
Caelo	Budesonide, micronized	14071701	1
Caelo	Budesonide, micronized	14071707	2
Caelo	Budesonide, micronized	14071713	1
Caelo	Budesonide, micronized	14071714	4
Caelo	Budesonide, micronized	14071706	1
Caelo	Budesonide, micronized	14071716	2
Caelo	Budesonide, micronized	14071717	3
Caelo	Budesonide, micronized	1471707	1
Fagron	Budesonide, micronized	14A30-B09291366	1
Fagron	Budesonide, micronized	14A30-B09-291366	2
Fagron	Budesonide, micronized	14H15-B02	3
Fagron	Budesonide, micronized	14H15-B02-297925	1
Fagron	Budesonide, micronized	14H15-B02-297926	1
Fagron	Budesonide, micronized	14H15-B02-301971	1
Fagron	Budesonide, micronized	14H15-B02-301972	1
Caelo	Budesonide, micronized	15173803	5
Caelo	Budesonide, micronized	15173811	3
Caelo	Budesonide, micronized	15173806	1
Caelo	Budesonide, micronized	15173810	1
Caelo	Budesonide, micronized	15173812	1
Caelo	Budesonide, micronized	15344003	5
Fagron	Budesonide, micronized	15E27B10	1
Fagron	Budesonide, micronized	15E27-B10-308321	1
Fagron	Budesonide, micronized	15E27-B10-308322	1
Bombastus	Budesonide, micronized	21100M1A0021321	1
Caelo	Budesonide, micronized	11175014	2
Caelo	Budesonide, micronized	11175015	1
Fagron	Budesonide, micronized	2184	1
Fagron	Budesonide, micronized	21100M1B0011621	1
Caelo	Budesonide, micronized	11351706	5
Caelo	Budesonide, micronized	16143102	1
Fagron	Budesonide, micronized	15E27-B10-315704	1
Caelo	Budesonide, micronized	11351701	1
Caelo	Budesonide, micronized	11351707	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Budesonide, micronized	12295103	1
Caelo	Budesonide, micronized	11351713	1
Fagron	Budesonide, micronized	12G23-N01	2
Fagron	Budesonide, micronized	12J29-N05	1
Caelo	Budesonide, micronized	21100M1	1
Caelo	Budesonide, micronized	11351703	1

- 55 903 spectra from 335 *Apo-Ident* customers from a total of 20 559 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	403	0	75 475
Type B	0	136	0	81 212
Type C	0	98	0	55 903

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5112 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.5882 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 93.8776 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20569	20569	0.00	32.71
20808	20808	0.00	35.87
21620	20808	6.40	33.75
22537	22537	0.00	27.14
22627	22627	0.00	27.42
22649	22627	3.82	33.37
22888	22627	6.00	32.94

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Butylated hydroxytoluene**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21307-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Butylated hydroxytoluene; Butylhydroxytoluenum; Butylhydroxytoluolum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Butylated hydrox...	13354602	21307	40	20131105
Caelo	Butylated hydrox...	13354604	21355	40	AR-15-FG-007846-02
Caelo	Butylated hydrox...	15172103	21911	40	20150529
Caelo	Butylated hydrox...	15172103	22281	40	20150529
Caelo	Butylated hydrox...	15172103	22350	40	20150529

Validation samples

A total of 213 227 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 *Butylated hydroxytoluene*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Butylated hydroxytoluene*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Butylated hydroxytoluene	11131002	20282	40
Caelo	Butylated hydroxytoluene	15172103	21911 [†]	20
Caelo	Butylated hydroxytoluene	15172103	22281 [†]	20
Caelo	Butylated hydroxytoluene	15172103	22350 [†]	20

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 123 spectra from 85 *Apo-Ident* customers from 34 batches from the substance/substance group *Butylated hydroxytoluene*.

Supplier	Substance	Batch	Spectra
Caelo	Butylated hydroxytoluene	7031403	1

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Butylated hydroxytoluene	13354602	4
Caelo	Butylated hydroxytoluene	12382309	7
Caelo	Butylated hydroxytoluene	13354604	5
Gehe	Butylated hydroxytoluene	13354604	1
Th. Geyer	Butylated hydroxytoluene	13354604	2
Caelo	Butylated hydroxytoluene	13354609	3
Phoenix	Butylated hydroxytoluene	13354609	1
Caelo	Butylated hydroxytoluene	13354611	1
Caelo	Butylated hydroxytoluene	143004502	1
Caelo	Butylated hydroxytoluene	1400501	1
Caelo	Butylated hydroxytoluene	14300501	6
Caelo	Butylated hydroxytoluene	14300502	5
Caelo	Butylated hydroxytoluene	14300505	4
Sanacorp	Butylated hydroxytoluene	14300505	1
Caelo	Butylated hydroxytoluene	15094501	3
Caelo	Butylated hydroxytoluene	15172101	6
Caelo	Butylated hydroxytoluene	15172103	8
Noweda	Butylated hydroxytoluene	15172103	1
Caesar & Loretz GmbH Hi...	Butylated hydroxytoluene	15172103	1
Caelo	Butylated hydroxytoluene	15172105	6
Phoenix	Butylated hydroxytoluene	15426801	1
Caesar & Loretz	Butylated hydroxytoluene	15426801	1
Caelo	Butylated hydroxytoluene	11131006	2
Caelo	Butylated hydroxytoluene	122080206	1
Caelo	Butylated hydroxytoluene	12280206	3
Caelo	Butylated hydroxytoluene	12280201	2
Phoenix	Butylated hydroxytoluene	3111201	1
Fagron	Butylated hydroxytoluene	11308701	1
Noweda	Butylated hydroxytoluene	12158201	1
Caelo	Butylated hydroxytoluene	12158201	3
Caelo	Butylated hydroxytoluene	12158204	5
Anzag 24.10.12	Butylated hydroxytoluene	12207004	1
Caelo	Butylated hydroxytoluene	12207005	3
Caelo	Butylated hydroxytoluene	1220705	1
Caelo	Butylated hydroxytoluene	12280203	8
Großhandel	Butylated hydroxytoluene	12280206	1
Anzag 122.04.13 ek: 3,76EUR	Butylated hydroxytoluene	12280206	1
Caelo	Butylated hydroxytoluene	12382302	6
Caelo	Butylated hydroxytoluene	12382304	6
Noweda	Butylated hydroxytoluene	12382304	1
Phoenix	Butylated hydroxytoluene	12382305	1
Caelo	Butylated hydroxytoluene	12382307	3
Caelo	Butylated hydroxytoluene	20161112-1	1
Caelo	Butylated hydroxytoluene	2113U02851	1

- 55 878 spectra from 335 *Apo-Ident* customers from a total of 20 577 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Butylated hydroxytoluene* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Butylated hydroxytoluene*

and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	0	81 248
Type C	0	117	6	55 878

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	95.1220 % (> 92.6829 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21307	21355	4.36	25.93
21355	21355	0.00	25.83
21911	21355	2.51	24.11
22281	21355	1.77	25.66
22350	21355	1.09	24.74

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Caffeine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20962-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Caffeine; Coffeinum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Caffeine	1211012-01	20962	40	1412248
Caelo	Caffeine	12317911	21089	40	20121113
Caelo	Caffeine	12317911	21205	40	20121113
Caelo	Caffeine	13233105	21456	40	20131008
Caelo	Caffeine	13233104	21548	40	20131008

Validation samples

A total of 213 227 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 *Caffeine*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Caffeine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Caffeine	2910019-03	20247	50
Caelo	Caffeine	13233105	21456 [†]	20
Caelo	Caffeine	13233104	21548 [†]	20
Euro OTC	Caffeine	1603009	22517	40
Caelo	Caffeine	15082303	22823	40

- 81 178 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 58 spectra from 31 *Apo-Ident* customers from 29 batches from the substance/substance group *Caffeine*.

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

Supplier	Substance	Batch	Spectra
Caelo	Caffeine	9301807	1
Caelo	Caffeine	11076807	2
Caelo	Caffeine		2
Caelo	Caffeine	11111111	1
Euro OTC	Caffeine	1109017-01	2
Anzag 03.05.2013	Caffeine	1205047-01	1
Caelo	Caffeine	12093410	2
Caelo	Caffeine	12093418	2
Euro OTC	Caffeine	1211012-01	1
Caelo	Caffeine	12317902	1
Caelo	Caffeine	1211012-01	1
Caelo	Caffeine	12317904	2
Euro OTC	Caffeine	1211012-02	1
Caelo	Caffeine	12317909	5
Caelo	Caffeine	12317906	1
Caelo	Caffeine	12317914	2
Euro OTC	Caffeine	1307049-01	3
Caelo	Caffeine	13233105	2
Caelo	Caffeine	13233111	3
Euro OTC	Caffeine	1411015-01	4
Euro OTC	Caffeine	1503020-01	3
Caelo	Caffeine	1503020-01	2
Euro OTC	Caffeine	1503020-02	2
Caelo	Caffeine	15054704	2
Caelo	Caffeine	15054709	2
Caelo	Caffeine	15082311	1
Euro OTC	Caffeine	188921AX20	1
Euro OTC	Caffeine	26081406	1
Caelo	Caffeine	3212E-01281	1
Gatt-Koller / Phoenix	Caffeine	5898/12135213	2
EUro/AHD	Caffeine	121012-01	1
EUro/AHD	Caffeine	1307049-01	1

- 55 943 spectra from 335 *Apo-Ident* customers from a total of 20 583 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	170	0	81 178
Type C	0	56	2	55 943

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.4706 %)
Type C	100.0000 % (> 99.8622 %)	96.5517 % (> 91.3793 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20962	20962	0.00	61.14
21089	20962	9.43	60.98
21205	20962	8.31	61.71
21456	20962	7.40	61.91
21548	20962	3.79	61.17

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Caffeine citrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20701-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Caffeine citrate; Coffeini citras; Coffeinum citricum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Caffeine citrate	12C16-N03	20701	40	1403477
Fagron	Caffeine citrate	15A05-B03-302746	21734	40	20150115
Gatt-Koller	Caffeine citrate	1783/05140715	21844	40	AR-15-FG-014994-01
Fagron	Caffeine citrate	15A05-B03-318006	22531	40	20150115
Fagron	Caffeine citrate	15A05-B03-302746	22729	40	20150115

Validation samples

A total of 213 227 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 *Caffeine citrate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

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

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Caffeine citrate	11F21-N05	20152	40
Fagron	Caffeine citrate	15A05-B03-302746	21734 [†]	20
Gatt-Koller	Caffeine citrate	1783/05140715	21844 [†]	20
Fagron	Caffeine citrate	15A05-B03-318006	22530	40

- 81 228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 60 spectra from 39 *Apo-Ident* customers from 34 batches from the substance/substance group *Caffeine citrate*.

Supplier	Substance	Batch	Spectra
Fagron	Caffeine citrate	11082015A	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
Fagron	Caffeine citrate	13D30-N02	8
Fagron	Caffeine citrate	11C29-N04	2
Fagron	Caffeine citrate	15A05-B03	2
Phoenix	Caffeine citrate	15A05-B03	1
Fagron	Caffeine citrate	15A05B03	1
Fagron	Caffeine citrate	15A05-B03-302746	3
Caelo	Caffeine citrate	15A05-B03-302746	1
Fagron	Caffeine citrate	15a05-b03-302746	1
Fagron	Caffeine citrate	15A05-B03302747	1
Fagron	Caffeine citrate	15A05-B03-318006	4
Fagron	Caffeine citrate	15A05-B03-307135	1
Rondell Apotheke	Caffeine citrate	15A05-B03-307309	1
Caelo	Caffeine citrate	15A05-B03-318006	1
Fagron	Caffeine citrate	15a05-b03-318006	1
Fagron	Caffeine citrate	2714E-01282	1
Fagron	Caffeine citrate	10H02-N02	2
Fagron	Caffeine citrate	3314E-01282	1
Fagron	Caffeine citrate	3914U-01282	1
Fagron	Caffeine citrate	CCD-1401	2
Fagron	Caffeine citrate	CCC1205	1
Fagron	Caffeine citrate	204311282	1
Fagron	Caffeine citrate	11/12-N13	1
Fargon	Caffeine citrate	12J05-N06	1
Fargon	Caffeine citrate	11F21-N05	1
Fagron	Caffeine citrate	12J05-N06	3
Holderman 21.01.2013	Caffeine citrate	12C16-N03	1
Fagron	Caffeine citrate	12J05-N06	1
Fagron	Caffeine citrate	12C16-N03	1
Fagron	Caffeine citrate	13B08-N02	1
Gehe	Caffeine citrate	13B08-N02	1
Caelo	Caffeine citrate	13D30-N02	1
Fagron	Caffeine citrate	13D30-No2	1
Fgron	Caffeine citrate	2013Q-01282	1
Fagron	Caffeine citrate	26021401	1
Fagron	Caffeine citrate	2002311282	1
Fagron	Caffeine citrate	5013U01282	1
Fagron	Caffeine citrate	4213U01282	1
Fagron	Caffeine citrate	3513I-01282	1
Fagron	Caffeine citrate	2813E1282	1
Noweda	Caffeine citrate	CCC-1101	1
AHD	Caffeine citrate	13B08-N02	1

- 55 941 spectra from 335 *Apo-Ident* customers from a total of 20 577 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	109	11	81 228
Type C	0	42	18	55 941

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	90.8333 % (> 88.3333 %)
Type C	100.0000 % (> 99.8622 %)	70.0000 % (> 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
20701	20701	0.00	75.01
21734	20701	13.14	75.60
21844	21844	0.00	55.30
22531	20701	18.89	75.78
22729	20701	5.74	76.92

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium ascorbate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20393-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Calcium ascorbate; Calcii ascorbas; Calcii ascorbinicum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium ascorbate	10365208	20393	40	AR-12-FG-008408-01
Caelo	Calcium ascorbate	13105624	21313	40	20130620
Euro OTC	Calcium ascorbate	1612003	22916	40	20170110*

Validation samples

A total of 213 227 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 *Calcium ascorbate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Calcium ascorbate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Calcium ascorbate	1607033-01	22812	40
Caelo	Calcium ascorbate	163111	23060	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 batches from the substance/substance group *Calcium ascorbate*.

Supplier	Substance	Batch	Spectra
Caelo	Calcium ascorbate	14340907	1
Burton Feingold	Calcium ascorbate	L008415	1

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Calcium ascorbate	L1502018-02	1
Euro OTC	Calcium ascorbate	L1502018-01	1
Euro OTC	Calcium ascorbate	L1508017-01	1
Caelo	Calcium ascorbate	13105608	1
Caelo	Calcium ascorbate	11159915	1
Euro OTC	Calcium ascorbate	L15218-2	1
Caelo	Calcium ascorbate	12097406	1
Farmalabor / Farmalabor	Calcium ascorbate	P1104931-000A	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	0	81 268
Type C	0	10	0	55 991

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20393	20393	0.00	38.72
21313	22916	3.60	40.36
22916	22916	0.00	41.71

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium citrate tetrahydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20013-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Calcium citrate tetrahydrate; Calcii citras tetrahydricus; Calcii citricum

Special notes

When selecting the *Calcium citrate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium citrate ...	90034189	20013	60	I 2009 000 304
Euro OTC	Calcium citrate ...	1305018-01	21249	40	20130528
Caelo	Calcium citrate ...	13391203	21486	40	20131205
Euro OTC	Calcium citrate ...	1509039	21931	40	20151013*
Euro OTC	Calcium citrate ...	1509039-01	22255	40	20151013
Euro OTC	Calcium citrate ...	1701001	22995	40	20170124*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 260 spectra of 6 reference samples from the substance/substance group *Calcium citrate tetrahydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 618 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 120 spectra of 4 reference samples from the substance/substance group *Calcium citrate tetrahydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Calcium citrate tetrahydrate	13391203	21320	40
Euro OTC	Calcium citrate tetrahydrate	1509039	21931 [†]	20
Euro OTC	Calcium citrate tetrahydrate	1509039-01	22255 [†]	20
Euro OTC	Calcium citrate tetrahydrate	1606001	22681	40

- 81 228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 136 spectra from 58 *Apo-Ident* customers from 73 batches from the substance/substance group *Calcium citrate tetrahydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Calcium citrate tetrahydrate		2
Euro OTC	Calcium citrate tetrahydrate	1402003-01	3
Caelo	Calcium citrate tetrahydrate	15177702	2
Euro OTC	Calcium citrate tetrahydrate	1509039-02	2
Caelo	Calcium citrate tetrahydrate	15375703	1
GEHE	Calcium citrate tetrahydrate	21022141/3	1
Caelo	Calcium citrate tetrahydrate	50/6	1
Caelo	Calcium citrate tetrahydrate	11349325	2
Caelo	Calcium citrate tetrahydrate	13391203	3
Caelo	Calcium citrate tetrahydrate	13391205	3
Euro OTC	Calcium citrate tetrahydrate	1408017-01	1
Caelo	Calcium citrate tetrahydrate	11168806	4
Euro OTC	Calcium citrate tetrahydrate	1305018-01	5
Caelo	Calcium citrate tetrahydrate	11061402	1
Caelo	Calcium citrate tetrahydrate	12310418	2
Caelo	Calcium citrate tetrahydrate	130501801	2
Euro OTC	Calcium citrate tetrahydrate	1305018-02	3
Euro OTC	Calcium citrate tetrahydrate	140801701	1
Caelo	Calcium citrate tetrahydrate	14133303	1
Alliance Health 23.10.2...	Calcium citrate tetrahydrate	1402003-01	1
Caelo	Calcium citrate tetrahydrate	1408017-01	1
Euro OTC	Calcium citrate tetrahydrate	14020031	1
Gehe Kassel	Calcium citrate tetrahydrate	14133307	1
Caelo	Calcium citrate tetrahydrate	14133310	1
Euro OTC	Calcium citrate tetrahydrate	1502012-02	1
Caelo	Calcium citrate tetrahydrate	1509039-01	2
EuRho	Calcium citrate tetrahydrate	1502012-02	1
Euro OTC	Calcium citrate tetrahydrate	1502012-2	1
Euro OTC	Calcium citrate tetrahydrate	1502021-02	1
Euro OTC	Calcium citrate tetrahydrate	1509039-01	1
Caelo	Calcium citrate tetrahydrate	15177703	2
Caelo	Calcium citrate tetrahydrate	15177701	1
Caelo	Calcium citrate tetrahydrate	16021502	1
Caelo	Calcium citrate tetrahydrate	2114M1209	1
Caelo	Calcium citrate tetrahydrate	3512U-01209	1
Euro OTC	Calcium citrate tetrahydrate	1107012-01	1
Fagron	Calcium citrate tetrahydrate	413031/2	1
Caelo	Calcium citrate tetrahydrate	11349304	2
Klenk	Calcium citrate tetrahydrate	1107012-02	3
Euro OTC	Calcium citrate tetrahydrate	3006222	1
Euro OTC	Calcium citrate tetrahydrate	1107012-02	1
Euro OTC	Calcium citrate tetrahydrate	1040896	1
Caelo	Calcium citrate tetrahydrate	11168813	1
Euro OTC	Calcium citrate tetrahydrate	1058904	1
Caelo	Calcium citrate tetrahydrate	11349309	2
Phönix	Calcium citrate tetrahydrate	1111036-01	2
Euro OTC	Calcium citrate tetrahydrate	1111036-01	1
Phönix	Calcium citrate tetrahydrate	1207006-01	3
Euro OTC	Calcium citrate tetrahydrate	1207006-01	2
Euro OTC	Calcium citrate tetrahydrate	1211007-01	4
Sanacorp	Calcium citrate tetrahydrate	1211007-01	1
Caelo	Calcium citrate tetrahydrate	12310401	2
Caelo	Calcium citrate tetrahydrate	121100701	1
EuRho/Jenne	Calcium citrate tetrahydrate	1211007-01	1
Euro OTC	Calcium citrate tetrahydrate	13031204	1
Caelo	Calcium citrate tetrahydrate	12310413	4
Caelo	Calcium citrate tetrahydrate	12310407	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Calcium citrate tetrahydrate	1305018-01	1
Fagron	Calcium citrate tetrahydrate	13d16-n06	1
Caelo	Calcium citrate tetrahydrate	92192429	1
Caelo	Calcium citrate tetrahydrate	92457399	1
Caelo	Calcium citrate tetrahydrate	11168803	1
Sanacorp	Calcium citrate tetrahydrate	111103601	1
Sanacorp	Calcium citrate tetrahydrate	1111036-01	2
Caelo	Calcium citrate tetrahydrate	11349313	1
Caelo	Calcium citrate tetrahydrate	11349301	1
Noweda	Calcium citrate tetrahydrate	11349309	1
Post-Apotheke	Calcium citrate tetrahydrate	11349313	1
Caelo	Calcium citrate tetrahydrate	11349315	1
Caelo	Calcium citrate tetrahydrate	11349320	1
Caelo	Calcium citrate tetrahydrate	11349318	4
Phönix 07.03.13	Calcium citrate tetrahydrate	11349325	1
Elementar	Calcium citrate tetrahydrate	11602007228939	1
Caelo	Calcium citrate tetrahydrate	1168806	1
Caelo	Calcium citrate tetrahydrate	1168813	1
Gehe 12.04.2013	Calcium citrate tetrahydrate	11K04-N09	1
Caelo	Calcium citrate tetrahydrate	12310401	1
Caelo	Calcium citrate tetrahydrate	12310402	2
Caelo	Calcium citrate tetrahydrate	12310403	2
Caelo	Calcium citrate tetrahydrate	12310406	2
Caelo	Calcium citrate tetrahydrate	12310411	2
Caelo	Calcium citrate tetrahydrate	12310417	3
Fagron	Calcium citrate tetrahydrate	13D16-N06	1
Caelo	Calcium citrate tetrahydrate	133912042x	1
Caelo	Calcium citrate tetrahydrate	19061315	1
Caelo	Calcium citrate tetrahydrate	71356168	1
Jungbunzlauer	Calcium citrate tetrahydrate	2012290954	1

- 55 865 spectra from 335 *Apo-Ident* customers from a total of 20 539 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	247	13	75 618
Type B	0	119	1	81 222
Type C	0	121	15	55 865

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.0000 % (> 93.8462 %)
Type B	100.0000 % (> 99.9853 %)	99.1667 % (> 96.6667 %)
Type C	100.0000 % (> 99.8622 %)	88.9706 % (> 86.7647 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20013	20013	0.00	52.34
21249	21931	3.62	58.10
21486	22995	5.57	49.55
21931	21931	0.00	59.60
22255	21931	2.98	57.35
22995	22995	0.00	56.57

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium gluconate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20871-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Calcium gluconate; Calcii gluconas; Calcii gluconicum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium gluconate	12236502	20871	40	1401575
Euro OTC	Calcium gluconate	1304012-01	21283	40	AR-15-FG-008127-01
Caelo	Calcium gluconate	12335829	21312	40	20121121
Euro OTC	Calcium gluconate	1407041-01	21821	40	20140818

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Calcium gluconate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 100 spectra of 3 reference samples from the substance/substance group *Calcium gluconate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Calcium gluconate	1005044-01	20270	40
Euro OTC	Calcium gluconate	1407041-01	21821 [†]	20
Euro OTC	Calcium gluconate	1606034	22699	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 73 spectra from 40 *Apo-Ident* customers from 35 batches from the substance/substance group *Calcium gluconate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Calcium gluconate	1407041-01	2
Euro OTC	Calcium gluconate	1209006-01	11

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
Fagron	Calcium gluconate	12/13-N04	1
EuRho	Calcium gluconate	12090006-01	1
Euro OTC	Calcium gluconate	1304012-01	7
Euro OTC	Calcium gluconate	1304012-02	6
Euro OTC	Calcium gluconate	130401202	1
Euro/Gehe	Calcium gluconate	1304012-01	1
Euro OTC	Calcium gluconate	140704101	1
Euro OTC	Calcium gluconate	140704102	1
Euro OTC	Calcium gluconate	1407041-02	5
Berkel AHK	Calcium gluconate	14085407	2
Caelo	Calcium gluconate	140704102	1
Fagron	Calcium gluconate	14D11-B04-292997	1
Caelo	Calcium gluconate	15126301	2
Fagron	Calcium gluconate	14D11-B04-294136	1
Fagron	Calcium gluconate	14D11-B04	1
Euro OTC	Calcium gluconate	1606034-01	1
Euro OTC	Calcium gluconate	Ch1407041-01	1
Caelo	Calcium gluconate	15435607	1
Gatt-Koller / Phoenix	Calcium gluconate	550/03141214	1
Phönix	Calcium gluconate	1606034-01	1
Fagron	Calcium gluconate	10G22-N12	1
Euro OTC	Calcium gluconate	513-Q1211	1
Euro OTC	Calcium gluconate	1105027	1
Euro OTC	Calcium gluconate	1105027-01	3
Fagron	Calcium gluconate	1105027-02	1
Euro OTC	Calcium gluconate	1105027-02	3
Caelo	Calcium gluconate	11121607	1
Euro OTC	Calcium gluconate	115027-01	1
gehe	Calcium gluconate	1209006-01	1
Euro OTC	Calcium gluconate	1209006	1
Eurho/Sns	Calcium gluconate	1209006-01	1
Caelo	Calcium gluconate	12335810	1
Caelo	Calcium gluconate	12335813	1
Caelo	Calcium gluconate	1235813	1
Fagron	Calcium gluconate	12D17-N01	1
Caelo	Calcium gluconate	14085405	1
Euro OTC	Calcium gluconate	20270912-1	1
Finze	Calcium gluconate	917857359	1
Euro OTC	Calcium gluconate	Ch1304012	1

- 55 928 spectra from 335 *Apo-Ident* customers from a total of 20 576 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	90	10	81 248
Type C	0	66	7	55 928

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	90.0000 % (> 87.0000 %)
Type C	100.0000 % (> 99.8622 %)	90.4110 % (> 86.3014 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20871	20871	0.00	35.03
21283	21283	0.00	26.34
21312	20871	5.86	35.63
21821	21283	2.30	26.14

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium glycerophosphate**
 Substance class APIs & excipients, solid
 Report date 12/04/2017
 Report number 20352-2017-04-12
 Executing company HiperScan GmbH
 Weißeritzstraße 3
 01067 Dresden
 Germany

Relevant substance names

Calcium glycerophosphate; Calcii glycerinophosphoricum; Calcii glycerophosphas

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Calcium glycerop...	11160607	20352	40	AR-12-FG-007581-01
Caelo	Calcium glycerop...	12012403	20507	40	AR-13-FG-002432-01
Caelo	Calcium glycerop...	12012417	20771	40	20120131
Fagron	Calcium glycerop...	13I17-N04	21234	40	20131016
Caelo	Calcium glycerop...	13007912	21311	40	20130124
Caelo	Calcium glycerop...	14341007	21969	40	AR-16-FG-005932-01
Fagron	Calcium glycerop...	15B03-B03-305050	21978	40	20150212

Validation samples

A total of 213 227 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 *Calcium glycerophosphate*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 240 spectra of 7 reference samples from the substance/substance group *Calcium glycerophosphate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Calcium glycerophosphate	12012411	20605	40
Caelo	Calcium glycerophosphate	12012405	20606	40
Caelo	Calcium glycerophosphate	12012411	20679	40
Caelo	Calcium glycerophosphate	12012417	20762	40
Caelo	Calcium glycerophosphate	12012413	20763	40
Caelo	Calcium glycerophosphate	14341007	21969 [†]	20
Fagron	Calcium glycerophosphate	15B03-B03-305050	21978 [†]	20

- 81 108 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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*.

- 51 spectra from 29 *Apo-Ident* customers from 34 batches from the substance/substance group *Calcium glycerophosphate*.

Supplier	Substance	Batch	Spectra
Caelo	Calcium glycerophosphate	13007914	2
Caelo	Calcium glycerophosphate	13007912	2
Caelo	Calcium glycerophosphate	13007908	1
Fagron	Calcium glycerophosphate	13/17-N04	1
Caelo	Calcium glycerophosphate	13007919	1
Caelo	Calcium glycerophosphate	13007922	1
Fagron	Calcium glycerophosphate	13A18N02	2
Fagron	Calcium glycerophosphate	1317-N04	2
Fagron	Calcium glycerophosphate	1314000019	1
Caelo	Calcium glycerophosphate	1341001	1
Caelo	Calcium glycerophosphate	14341007	3
Caelo	Calcium glycerophosphate	1431001	1
Caelo	Calcium glycerophosphate	14341009	1
Caelo	Calcium glycerophosphate	14341012	2
Fagron	Calcium glycerophosphate	14B10-B02-291642	2
Caelo	Calcium glycerophosphate	14347101	2
Fagron	Calcium glycerophosphate	14B10-B02-296841	2
Fagron	Calcium glycerophosphate	14B10B02	1
Caelo	Calcium glycerophosphate	14B10-B02-296841	1
Fagron	Calcium glycerophosphate	14B10-B02-296842	1
Fagron	Calcium glycerophosphate	15B03B03	1
Caelo	Calcium glycerophosphate	15B03B03305050	1
Fagron	Calcium glycerophosphate	3115A-01212	1
Caelo	Calcium glycerophosphate	16231004	1
Fagron	Calcium glycerophosphate	12/18-N06	2
Caelo	Calcium glycerophosphate	12012406	1
Fagron	Calcium glycerophosphate	12I18-N06	3
Fagron	Calcium glycerophosphate	5212M-01212	1
Fagron	Calcium glycerophosphate	11G19-N05	1
Fagron	Calcium glycerophosphate	1216000005	1
Caelo	Calcium glycerophosphate	13007902	1
Caelo	Calcium glycerophosphate	12012413	1
Fagron	Calcium glycerophosphate	13A18-N02	4
Caelo	Calcium glycerophosphate	13A18-No2	1
Gatt-Koller/Kwizda	Calcium glycerophosphate	4007/09123812	1

- 55 950 spectra from 335 *Apo-Ident* customers from a total of 20 578 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	240	0	81 104
Type C	0	51	0	55 950

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 88.2353 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20352	20352	0.00	34.29
20507	20507	0.00	33.18
20771	21969	15.85	36.41
21234	21969	3.76	33.45
21311	21969	3.99	32.72
21969	21969	0.00	33.61
21978	20507	4.64	34.12

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Calcium lactate pentahydrate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20745-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Calcium lactate pentahydrate; Calcii lactas pentahydricus; Calcii lacticum pentahydricum

Special notes

When selecting the *Calcium lactate pentahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Calcium lactate ...	12E10-N03	20745	40	20120704
Fagron	Calcium lactate ...	12I12-N06	21232	40	AR-15-FG-007939-01
Caelo	Calcium lactate ...	15101401	21909	40	20150407
Caelo	Calcium lactate ...	15101405	22263	40	20150407
Caelo	Calcium lactate ...	161313	22445	40	20160513*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium lactate pentahydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Calcium lactate pentahydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Calcium lactate pentahydrate	pending	20516	40
Caelo	Calcium lactate pentahydrate	15101401	21909 [†]	20
Caelo	Calcium lactate pentahydrate	15101405	22263 [†]	20
Caelo	Calcium lactate pentahydrate	161313	22445 [†]	20

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 35 spectra from 13 *Apo-Ident* customers from 23 batches from the substance/substance group *Calcium lactate pentahydrate*.

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

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

Supplier	Substance	Batch	Spectra
Caelo	Calcium lactate pentahydrate	11369606	1
Fagron	Calcium lactate pentahydrate	12I12-N06	2
Caelo	Calcium lactate pentahydrate	13080804	2
Fagron/Sanacorp	Calcium lactate pentahydrate	14H01-B05	1
Caelo	Calcium lactate pentahydrate	13080805	2
Fagron	Calcium lactate pentahydrate	13L18-B04-295541	2
Fagron	Calcium lactate pentahydrate	13L18B04	1
Caelo	Calcium lactate pentahydrate	14H01B05300502	1
Caelo	Calcium lactate pentahydrate	15101411	2
Caelo	Calcium lactate pentahydrate	15101409	1
Caelo	Calcium lactate pentahydrate	15227804	2
Shop	Calcium lactate pentahydrate	1111001829	1
Caelo	Calcium lactate pentahydrate	11369610	1
Caelo	Calcium lactate pentahydrate	11369614	2
Krämer&Martin	Calcium lactate pentahydrate	11612009053019	1
Caelo	Calcium lactate pentahydrate	11369618	1
Fagron	Calcium lactate pentahydrate	11126-N15	1
Fagron	Calcium lactate pentahydrate	12C15-N02	3
Fagron	Calcium lactate pentahydrate	12/12-N06	1
Caelo	Calcium lactate pentahydrate	12C15-N02	2
Fagron	Calcium lactate pentahydrate	12I12-N01	1
Caelo	Calcium lactate pentahydrate	13080802	2
Caelo	Calcium lactate pentahydrate	12E10-N03	1
Stockmeier Food	Calcium lactate pentahydrate	2012331885	1

- 55 966 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	0	81 248
Type C	0	35	0	55 966

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 82.8571 %)

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

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20745	21232	6.41	47.69
21232	21232	0.00	44.58
21909	21232	3.14	46.87
22263	21232	7.60	44.29
22445	22445	0.00	48.34

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium orotate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20418-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Calcium orotate dihydrate; Calcii orotas; Calcii oroticum

Special notes

When selecting the *Calcium orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Pharmorgana	Calcium orotate ...	1000139407	20418	40	AR-12-FG-008407-01
Fagron	Calcium orotate ...	12L04-N07	20824	40	20121207
Fagron	Calcium orotate ...	13J23-N05	21227	40	20131111
Euro OTC	Calcium orotate ...	1401006-01	21245	40	1412540
Euro OTC	Calcium orotate ...	1603003	22520	40	20160329*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Calcium orotate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 120 spectra of 3 reference samples from the substance/substance group *Calcium orotate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Calcium orotate dihydrate	1009035-01	20535	40
Euro OTC	Calcium orotate dihydrate	1009035-01	20814	40
Euro OTC	Calcium orotate dihydrate	1411003	22519	40

- 81 228 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 batches from the substance/substance group *Calcium orotate dihydrate*.

Supplier	Substance	Batch	Spectra
Microsin Pharmorgana	Calcium orotate dihydrate	ORC00413	1

continued on the next page

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

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Calcium orotate dihydrate	1203037-01	2
Euro OTC	Calcium orotate dihydrate	1009035-01	2
Pharmorgana	Calcium orotate dihydrate	ORC00113	1
Euro OTC	Calcium orotate dihydrate	1401006-01	1
Pharmorgana	Calcium orotate dihydrate	ORC00213	1

- 55 993 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	40	80	81 228
Type C	0	8	0	55 993

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	33.3333 % (> 30.8333 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20418	20418	0.00	61.26
20824	20418	3.75	61.13
21227	21245	2.44	60.52
21245	21245	0.00	61.59
22520	22520	0.00	66.29

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Calcium pantothenate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20395-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Calcium pantothenate; Calcii panthothenas; Calcii panthothenicum

Special notes

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

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Calcium pantothe...	11J20-N01	20395	40	AR-12-FG-008444-01
Fagron	Calcium pantothe...	13H28-N11	21233	40	20130916
Euro OTC	Calcium pantothe...	1305034-01	21243	40	20130617
Caelo	Calcium pantothe...	14208012	21765	40	20140722
Euro OTC	Calcium pantothe...	1509024	21901	40	20151005*
Euro OTC	Calcium pantothe...	1603042	22551	40	20160429*
Euro OTC	Calcium pantothe...	1607023	22691	40	20160809*

Validation samples

A total of 213 227 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 *Calcium pantothenate*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 80 spectra of 3 reference samples from the substance/substance group *Calcium pantothenate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Calcium pantothenate	10I22-N05	20444	40
Caelo	Calcium pantothenate	14208012	21765 [†]	20
Euro OTC	Calcium pantothenate	1509024	21901 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 58 spectra from 30 *Apo-Ident* customers from 41 batches from the substance/substance group *Calcium pantothenate*.

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

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

Supplier	Substance	Batch	Spectra
Caelo	Calcium pantothenate	14208004	1
Caelo	Calcium pantothenate	12340832	1
Caelo	Calcium pantothenate	15143914	1
Caelo	Calcium pantothenate	12340846	1
Fagron	Calcium pantothenate	13H28-N11	1
Fagron	Calcium pantothenate	14G02-B10-297373	1
Fagron	Calcium pantothenate	13H28N11	1
Fagron	Calcium pantothenate	1111110405	1
Euroo/Anzag	Calcium pantothenate	1509024-01	2
Caelo	Calcium pantothenate	12340808	3
Caelo	Calcium pantothenate	11105731	1
Fagron	Calcium pantothenate	11L20-N11	1
Fagron	Calcium pantothenate	14G02-B10-301624	1
Caelo	Calcium pantothenate	12340809	1
Fagron	Calcium pantothenate	12G05-N12	1
Fagron	Calcium pantothenate	13B22-N01	1
Euro OTC	Calcium pantothenate	5121405	1
Euro OTC	Calcium pantothenate	10021505	1
Caelo	Calcium pantothenate	8041407	1
Caelo	Calcium pantothenate	12340859	1
Euro OTC	Calcium pantothenate	1305034-01	4
Euro OTC	Calcium pantothenate	1410011-01	1
Euro OTC	Calcium pantothenate	1410011-02	3
Euro OTC	Calcium pantothenate	1312027-01	3
Euro OTC	Calcium pantothenate	1509024-01	2
Noweda	Calcium pantothenate	14208012	1
Fagron	Calcium pantothenate	14G02-B10	1
Euro OTC	Calcium pantothenate	1603042-01	1
Gehe	Calcium pantothenate	1004024-01	1
Caelo	Calcium pantothenate	1013Q-03022	1
Euro OTC	Calcium pantothenate	1111025-01	3
Fagron	Calcium pantothenate	1111025-01	1
Euro OTC	Calcium pantothenate	1209022-01	1
Euro OTC	Calcium pantothenate	1209022-02pzn	1
Daiichi	Calcium pantothenate	1209022-01	1
Caelo	Calcium pantothenate	12236622	1
Caelo	Calcium pantothenate	27111303	1
Euro OTC	Calcium pantothenate	120902202	1
Euro OTC	Calcium pantothenate	1209022-02	1
Caelo	Calcium pantothenate	12340819	2
Fagron	Calcium pantothenate	12F19-N07	1
Euro OTC	Calcium pantothenate	130503401	1
Euro OTC	Calcium pantothenate	17021401	1
Gatt-Koller / Phoenix	Calcium pantothenate	3783/09112912	1

- 55 943 spectra from 335 *Apo-Ident* customers from a total of 20 571 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	80	0	81 268
Type C	0	56	2	55 943

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	96.5517 % (> 91.3793 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20395	20395	0.00	17.11
21233	20395	3.33	17.93
21243	20395	3.37	16.30
21765	20395	3.85	17.07
21901	21901	0.00	21.30
22551	22551	0.00	16.91
22691	22691	0.00	14.50

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Camphor**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20028-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Camphor; Camphora

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Camphor	82383109	20028	30	I 2009 000 293
Euro OTC	Camphor	2906016-02	20189	40	AR-12-FG-004455-01
Euro OTC	Camphor	1106007-02	20328	40	20110701
Euro OTC	Camphor	1406029-01	21599	40	20140708
Fagron	Camphor	14E19-B07-300365	22256	40	20140527
Caelo	Camphor	15316801	22279	40	20151029
Caelo	Camphor	162354	23065	40	20160809*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Camphor*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Camphor*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Camphor	11074503	20287	40
Euro OTC	Camphor	1406029-01	21599 [†]	20
Fagron	Camphor	14E19-B07-300365	22256 [†]	20
Caelo	Camphor	15316801	22279 [†]	20

- 81 248 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 265 spectra from 137 *Apo-Ident* customers from 130 batches from the substance/substance group *Camphor*.

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

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

Supplier	Substance	Batch	Spectra
Caelo	Camphor	3091203	1
Euro OTC	Camphor	113Q-01221	1
Caelo	Camphor	312M-01219	1
Caelo	Camphor	4101303	1
Sanacorp	Camphor	444A130115	1
Caelo	Camphor	4031503	1
Caelo	Camphor	315E-01221	1
Klenk	Camphor	444A140526	2
Klenk	Camphor	444A160817	1
xxx	Camphor	709E-01221	1
Caesar/Noweda	Camphor	1032	1
Caelo	Camphor	1087	1
Caelo	Camphor	11032035	3
Caelo	Camphor	713A-01221	1
Euro OTC	Camphor	1101029-02/Ch241011	1
Caesar & Loretz GmbH, 4...	Camphor	11032035	1
Post-Apotheke 22.01.2013	Camphor	11032012	1
sanacorp	Camphor	11074501	1
Caelo	Camphor	11286905	5
Caelo	Camphor	11286909	2
Caelo	Camphor	11286910	1
Fagron	Camphor	11H30-N15	2
Fagron	Camphor	11K23-N04	1
Noweda	Camphor	1202021-01	1
Euro OTC	Camphor	1202021-01	4
Anzag ek:8.85EUR 23.08.12	Camphor	1202021-01	1
Euro OTC	Camphor	1202021	1
Anzag 17.06.2013	Camphor	1202021-02	1
Caelo	Camphor	12054105	1
Phönix	Camphor	1202021-02	1
Euro OTC	Camphor	1202021-02	1
Caelo	Camphor	12054107	5
Caelo	Camphor	12054114	2
Caelo	Camphor	12054113	1
Caelo	Camphor	12054124	3
Caelo	Camphor	12054141	6
Caelo	Camphor	12054142	6
Caelo	Camphor	12054149	6
Caelo	Camphor	12054143	1
Caelo	Camphor	12054151	2
Caelo	Camphor	120564113	1
Caelo	Camphor	12061411	1
EuRho	Camphor	1210030-01	2
Euro OTC	Camphor	1210030-01	9
Euro OTC	Camphor	121003001	1
Gehe	Camphor	1210030-01	1
Großhandel	Camphor	1210030-02	1
Euro OTC	Camphor	1210030-02	4
Caelo	Camphor	1210030-02	1
Caelo	Camphor	12344905	6
Caelo	Camphor	12243701	1
Caelo	Camphor	12228206	1
Caelo	Camphor	12228205	1
	Camphor	12344909	1
Fagron	Camphor	12B14-N09	1
Fagron	Camphor	12D23-N03	2
Fagron	Camphor	12G02-N09	3
Euro OTC	Camphor	1303013-01	6
Euro OTC	Camphor	1303013-02	8
euroct/gehe	Camphor	1303013-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Großhandel	Camphor	1303013-02	2
EuRho	Camphor	1303013-02	2
Caelo	Camphor	13108106	2
Caelo	Camphor	1309019-03	1
Euro OTC	Camphor	1309019-02	1
Cealo/ Noweda	Camphor	13108116	1
Caelo	Camphor	13108114	2
Caelo	Camphor	13108110	1
Caelo	Camphor	13108118	1
Caelo	Camphor	13195301	2
Caelo	Camphor	13195314	5
Caelo	Camphor	13195316	5
Caelo	Camphor	13195318	1
Caelo	Camphor	13195322	4
Caelo	Camphor	13195328	1
Caelo	Camphor	13205501	2
Caelo	Camphor	13205502	1
Caelo	Camphor	13205512	1
Caelo	Camphor	13205522	4
Cae	Camphor	13205512	1
Fagron	Camphor	13H23-B40-291888	1
Fagron	Camphor	13h23-b40-294116	1
Fagron	Camphor	13K28-B04	2
Phönix	Camphor	13K28-B04	1
Camphor & Allied Produc...	Camphor	1406029-01	1
Euro OTC	Camphor	1412023-01	1
Fagron	Camphor	13K28-B04-294937	1
Phönix Gotha	Camphor	14202801	1
Euro OTC	Camphor	1406029-02	1
phönix	Camphor	14202801	1
Caelo	Camphor	14202801	1
Sanacorp	Camphor	14224303	1
Caelo	Camphor	14224303	3
Caelo	Camphor	14202807	1
Caelo	Camphor	14310703	1
Caelo	Camphor	14310705	9
Caelo	Camphor	14224304	1
Caesar&Loretz	Camphor	14310719	1
Fagron	Camphor	14G23-B04	2
Phönix	Camphor	1480	2
Fagron	Camphor	14G23-B04-296868	1
Fagron	Camphor	14G23-B04-299202	2
Fagron	Camphor	14G23-B04-301879	1
Caelo	Camphor	15062702	4
Fagron	Camphor	14G23-B04-301878	1
Caelo	Camphor	15086801	1
Calo/AHD	Camphor	15086803	1
Fagron	Camphor	15097801	1
Caelo	Camphor	15097803	2
Caelo	Camphor	15316807	2
Caesar & Loretz GmbH Hi...	Camphor	15316801	1
Caelo	Camphor	15316806	2
Phoenix	Camphor	15316811	1
Caelo	Camphor	15120901	1
Caelo	Camphor	15316811	2
Caelo	Camphor	15316812	1
Caelo	Camphor	15316815	2
Caelo	Camphor	15397704	1
Camphor & Allied Produc...	Camphor	16209302	1
Caelo	Camphor	16209301	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
EuRho	Camphor	2111E-01219	1
Euro OTC	Camphor	2803020-01	2
Galke	Camphor	23624	1
Caelo	Camphor	2344905	1
Caelo	Camphor	25041401	1
Caelo	Camphor	2811Q-01221	1
Caelo	Camphor	5315I-01221	1
AHD, 30.10.2013	Camphor	747564	1
Fagron	Camphor	690442	1
Caelo	Camphor	914E-01221	1
Gehe	Camphor	10L08-N06	1
Fagron	Camphor	825653	1
Euro OTC	Camphor	1101029-02	1
Euro OTC	Camphor	1106007-02	1
Caelo	Camphor	1202021-01	2
Caelo	Camphor		1
GEHE	Camphor	12K17-N09	1
Caelo	Camphor	13195311	2
Caelo	Camphor	13195304	1
Fagron	Camphor	1309019-02	1
Fagron	Camphor	13K28B04294933	1
Caelo	Camphor	13195323	1
Caelo	Camphor	15316801	1
Caelo	Camphor	4444A150721	1
Caelo	Camphor	4444A140526	1
Caelo	Camphor	4444A100826	1
Klenk	Camphor	4444A150721	1
Caelo	Camphor	11032025	1
Caelo	Camphor	11032023	1
Caelo	Camphor	1210030-01	1
Caelo	Camphor	13195320	1
Caelo	Camphor	11074509	1
Caelo	Camphor	13205511	1

- 55 736 spectra from 335 *Apo-Ident* customers from a total of 20 482 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	100	0	81 248
Type C	0	258	7	55 736

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.3585 % (> 96.2264 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20028	20028	0.00	44.80
20189	20189	0.00	41.76
20328	23065	6.33	42.41
21599	20028	6.38	43.50
22256	20189	3.36	40.53
22279	23065	5.15	41.88
23065	23065	0.00	43.46

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Capsaicin, natural**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20854-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Capsaicin, natural; Capsaicinoida

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Capsaicin, natural	13D12-N01	20854	40	1411392
Fagron	Capsaicin, natural	13J07-N07	21340	40	AR-15-FG-007151-01
Euro OTC	Capsaicin, natural	118066-04	21638	40	20140227
Euro OTC	Capsaicin, natural	1603005-01	22930	40	20160401

Validation samples

A total of 213 227 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 *Capsaicin, natural*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 70 spectra of 3 reference samples from the substance/substance group *Capsaicin, natural*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Capsaicin, natural	118066-04	21638 [†]	20
Euro OTC	Capsaicin, natural	1603005-01	22931	40
Euro OTC	Capsaicin, natural	1603005-01	not required	10

- 81 278 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Capsaicin, natural*.

Supplier	Substance	Batch	Spectra
Euro OTC	Capsaicin, natural	1401043-02	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	70	0	81 278
Type C	0	1	0	56 000

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 91.4286 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20854	20854	0.00	17.56
21340	21340	0.00	18.50
21638	21340	9.25	22.85
22930	21340	7.29	16.41

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Captopril**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20890-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Captopril; Captoprilum

Special notes

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

no information

Applicable documents

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

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

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

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

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

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

Calibration samples

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

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Captopril	12G25-N08	20890	40	20120814
Caelo	Captopril	12339610	21064	40	1403227
Caelo	Captopril	15189502	21874	40	AR-15-FG-014855-01
Fagron	Captopril	14B26-B01-312221	21921	40	20140317

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Captopril*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Captopril*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Captopril	10L09-N17	20255	30
Caelo	Captopril	15189502	21874 [†]	20
Fagron	Captopril	14B26-B01-312221	21921 [†]	20
Caelo	Captopril	15189502	21874SI	60
Fagron	Captopril	14B26-B01-312221	21921SI	60

- 81 158 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 96 spectra from 35 *Apo-Ident* customers from 47 batches from the substance/substance group *Captopril*.

[†]These spectra were recorded from 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
Fagron	Captopril	80616-6	1
Caelo	Captopril	12339616	2
Caelo	Captopril	12339604	2
Caelo	Captopril	12339606	1
Caelo	Captopril	12339605	4
Caelo	Captopril	12339607	1
Herstellung	Captopril	12339607	1
Caelo	Captopril	12339611	2
Caelo	Captopril	12339610	2
Caelo	Captopril	12339618	1
AHD, 24.09.2013	Captopril	12339608	1
Caelo	Captopril	12339619	1
Caelo	Captopril	12F29-N04	1
Fagron	Captopril	12G25-N08	11
Fagron	Captopril	12J09-N09	1
Caelo	Captopril	14196903	2
Caelo	Captopril	14196901	1
Caelo	Captopril	14196902	1
Fagron	Captopril	12K-16N04	1
Fagron	Captopril	14196902	1
Fagron	Captopril	12K16-N04	1
Caelo	Captopril	14196904	5
Caelo	Captopril	14196905	4
Caelo	Captopril	14196906	1
Phonix	Captopril	14B26-B01	1
Fagron	Captopril	14B26-B01	1
Fagron	Captopril	14B26-B012911557	1
Fagron	Captopril	14B26B01	1
Fagron	Captopril	14B26-B01-291555	4
Caelo	Captopril	14B26-B01-291555	1
Fagron	Captopril	14B26-B01-291557	6
Fagron	Captopril	14B26-B01-291556	1
Sonnenberg-Apotheke	Captopril	14B26-B01-291557	2
Fagron	Captopril	14B26-B01-302338	1
Caelo	Captopril	14B26-B01-291557	1
Fagrron	Captopril	14B26-B01-310127	1
Fagron	Captopril	14B26-B01-310127	1
Caelo	Captopril	14B26-B01-310127	1
Fagron	Captopril	14B26-B01-314460	1
Fagron	Captopril	14B26-B40-320183	2
Fargon/Sanacorp	Captopril	14B26-B40-318894	1
Caelo	Captopril	15189501	2
Caelo	Captopril	14B26-B01-310127	1
Caelo	Captopril	15189502	2
Fagron	Captopril	14B26-W0129-1557	1
Euro OTC	Captopril	15189507	3
Caelo	Captopril	15189509	1
Caelo	Captopril	15189511	1
Caelo	Captopril	15189510	1
Caelo	Captopril	15189514	3
Caelo	Captopril	15189517	1
Fagron	Captopril	14b26-B01-291555	1
Caelo	Captopril	14B26-B40	1
Fagron	Captopril	EC140101	1
Caelo	Captopril	14B26-B40-325275	1

- 55 905 spectra from 335 *Apo-Ident* customers from a total of 20 565 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

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

Validation results

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

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	132	58	81 158
Type C	0	88	8	55 905

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

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	69.4737 % (> 67.8947 %)
Type C	100.0000 % (> 99.8622 %)	91.6667 % (> 88.5417 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20890	21064	6.00	36.37
21064	21064	0.00	35.86
21874	21874	0.00	43.86
21921	21874	11.94	43.66

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Carbomer 35000 / 50000**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20548-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Carbomer 35000 / 50000

Special notes

When selecting the *Carbomer 35000 / 50000* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Carbomer 35000 / 50000*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Carbomer 35000 /...	11351507	20548	40	20120105
Caelo	Carbomer 35000 /...	11351604	20550	40	20120106
Caelo	Carbomer 35000 /...	11351611	20561	40	20120106
Caelo	Carbomer 35000 /...	13135601	20978	40	1403767
Caelo	Carbomer 35000 /...	13186207	20979	40	1403768
Caelo	Carbomer 35000 /...	14057902	21354	40	20140228

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Carbomer 35000 /...	1311027-02	21561	40	20131205
Euro OTC	Carbomer 35000 /...	1512010	22250	40	20151216*
Euro OTC	Carbomer 35000 /...	1604032	22548	40	20160428*
Euro OTC	Carbomer 35000 /...	1607028	22686	40	20160804*
Caelo	Carbomer 35000 /...	162530	22759	40	20161011*
Euro OTC	Carbomer 35000 /...	1610024	22852	40	20161102*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 480 spectra of 12 reference samples from the substance/substance group *Carbomer 35000 / 50000*. These samples are listed above in the [calibration samples](#) section.
- 75 398 spectra from a total of 1564 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 100 spectra of 3 reference samples from the substance/substance group *Carbomer 35000 / 50000*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Carbomer 35000 / 50000	14057903	21557	60
Euro OTC	Carbomer 35000 / 50000	1311027-02	21561 [†]	20
Euro OTC	Carbomer 35000 / 50000	1512010	22250 [†]	20

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B*

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

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

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

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 199 spectra from 117 *Apo-Ident* customers from 68 batches from the substance/substance group *Carbomer 35000 / 50000*.

Supplier	Substance	Batch	Spectra
Euro OTC	Carbomer 35000 / 50000	101616773	1
Caelo	Carbomer 35000 / 50000	12274907	8
Euro OTC	Carbomer 35000 / 50000	1311027-01	3
Euro OTC	Carbomer 35000 / 50000	1305007-01	2
Euro OTC	Carbomer 35000 / 50000	1311027-02	5
Caelo	Carbomer 35000 / 50000	13194503	7
Caelo	Carbomer 35000 / 50000	1311027-02	1
Caelo	Carbomer 35000 / 50000	13194501	6
Caelo	Carbomer 35000 / 50000	14016208	7
Caelo	Carbomer 35000 / 50000	14057903	2
Caelo	Carbomer 35000 / 50000	14016209	3
Euro OTC	Carbomer 35000 / 50000	1410001-01	7
Euro OTC	Carbomer 35000 / 50000	141000101	1
EuRho	Carbomer 35000 / 50000	1410001-01	1
Caelo	Carbomer 35000 / 50000	1410001-02	1
Sanacorp	Carbomer 35000 / 50000	14149911	1
Caelo	Carbomer 35000 / 50000	15015703	2
Fischer/Gehe	Carbomer 35000 / 50000	1410001-02	1
Caelo	Carbomer 35000 / 50000	15101801	3
Euro OTC	Carbomer 35000 / 50000	1512010-01	4
Alliance H.	Carbomer 35000 / 50000	1512010-01	1
Euro OTC	Carbomer 35000 / 50000	1512010-02	1
Caelo	Carbomer 35000 / 50000	15439002	2
Caelo	Carbomer 35000 / 50000	15439003	6
Euro OTC	Carbomer 35000 / 50000	1604032-01	1
Caelo	Carbomer 35000 / 50000	2215M-01232	1
Euro OTC	Carbomer 35000 / 50000	1607028-01	1
Phoenix	Carbomer 35000 / 50000	1305007-01	1
Euro OTC	Carbomer 35000 / 50000	4311027-01	1
Sanacorp	Carbomer 35000 / 50000	1311027-01	1
Caelo	Carbomer 35000 / 50000	1308006-01	1
Caelo	Carbomer 35000 / 50000	13186207	4
Phoenix	Carbomer 35000 / 50000	13194505	1
Caelo	Carbomer 35000 / 50000	13194507	5
Sanacorp	Carbomer 35000 / 50000	6/AKD13	1
Euro OTC	Carbomer 35000 / 50000	101217279	1
Caelo	Carbomer 35000 / 50000	11351605	2
Caelo	Carbomer 35000 / 50000	11351604	2
Phoenix 25.07.2012	Carbomer 35000 / 50000	11351605	1
Caelo	Carbomer 35000 / 50000	11351618	4
Euro OTC	Carbomer 35000 / 50000	1202020-01	2
Euro OTC	Carbomer 35000 / 50000	1210037-01	7
EuRho	Carbomer 35000 / 50000	1210037-01	1
Gehe 01.07.2013	Carbomer 35000 / 50000	12274908	2
Caelo	Carbomer 35000 / 50000	12274912	5
Caelo	Carbomer 35000 / 50000	12274916	11
Caelo	Carbomer 35000 / 50000	12274910	3
Euro/Sanacorp	Carbomer 35000 / 50000	1305007-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Carbomer 35000 / 50000	12274922	1
Caelo	Carbomer 35000 / 50000	13186205	5
GEHE	Carbomer 35000 / 50000	11351616	1
Caelo	Carbomer 35000 / 50000	14149910	1
Caelo	Carbomer 35000 / 50000	15015709	2
Caelo	Carbomer 35000 / 50000	15101809	2
Caelo	Carbomer 35000 / 50000	15101802	3
Caelo	Carbomer 35000 / 50000	15101807	1
Caelo	Carbomer 35000 / 50000	15257401	1
Caelo	Carbomer 35000 / 50000	15101810	1
Caesar & Loretz GmbH Hi...	Carbomer 35000 / 50000	15101809	1
Caelo	Carbomer 35000 / 50000	12274908	5
Caelo	Carbomer 35000 / 50000	13186203	3
Caelo	Carbomer 35000 / 50000	13194512	1
Phoenix 16.04.2014	Carbomer 35000 / 50000	13194503	1
Caelo	Carbomer 35000 / 50000	14149904	1
Caelo	Carbomer 35000 / 50000	14057902	1
Caelo	Carbomer 35000 / 50000	14149906	2
Ichthyol/Phönix	Carbomer 35000 / 50000	14149905	1
Sanacaorp	Carbomer 35000 / 50000	14149905	1
Caelo	Carbomer 35000 / 50000	14149911	1
Caelo	Carbomer 35000 / 50000	14149905	1
Caelo	Carbomer 35000 / 50000	15015702	1
Caelo	Carbomer 35000 / 50000	11013605	2
Fagron	Carbomer 35000 / 50000	13194503	1
Gehe	Carbomer 35000 / 50000	13194505	1
Caelo	Carbomer 35000 / 50000	13194505	2
Caelo	Carbomer 35000 / 50000	13194511	1
Caelo	Carbomer 35000 / 50000	11013613	1
Caelo	Carbomer 35000 / 50000	10157812	1
Caelo	Carbomer 35000 / 50000	11307511	1
Caelo	Carbomer 35000 / 50000	11351601	1
Caelo	Carbomer 35000 / 50000	11351616	1
Erika apotheke	Carbomer 35000 / 50000	11351618	1
Caelo	Carbomer 35000 / 50000	11351623	1
Caelo	Carbomer 35000 / 50000	12274914	4
Hepart AG	Carbomer 35000 / 50000	12274916	1
Sanacorp	Carbomer 35000 / 50000	12274922	1
Caelo	Carbomer 35000 / 50000	13186201	2
Caelo	Carbomer 35000 / 50000	28111310	1
Caelo	Carbomer 35000 / 50000	2913M1232	1
Caelo	Carbomer 35000 / 50000	31631293	1

- 55 802 spectra from 335 *Apo-Ident* customers from a total of 20 543 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Carbomer 35000 / 50000* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Carbomer 35000 / 50000* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect.

The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	479	1	75 398
Type B	0	100	0	81 248
Type C	0	189	10	55 802

The substance/substance group *Carbomer 35000 / 50000* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	99.7917 % (> 99.1667 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	94.9749 % (> 93.4673 %)

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

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

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

Identity according to identity test using NIR spectroscopy

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

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20548	20978	4.32	45.53
20550	22852	1.90	38.72
20561	22686	2.67	39.66
20978	20978	0.00	43.96
20979	20979	0.00	39.89
21354	22852	7.01	42.53
21561	22686	5.21	37.51
22250	22250	0.00	40.33
22548	22548	0.00	37.15
22686	22686	0.00	38.62
22759	22759	0.00	37.82
22852	22852	0.00	39.01

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

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Carmellose sodium (400/450/500/600/1600 mPa · s)
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20866-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Carmellose sodium (400/450/500/600/1600 mPa · s); Carmellosum natricum (400/450/500/600/1600 mPa · s); Natrii carboxymethylcellulosi (400/450/500/600/1600 mPa · s)

Special notes

When selecting the *Carmellose sodium (400/450/500/600/1600 mPa · s)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

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

Validation method

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

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

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

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Carmellose sodium (400/450/500/600/1600 mPa · s)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Carmellose sodiu...	12354404	20866	40	1401185
Caelo	Carmellose sodiu...	13104807	20872	40	1401186
Fagron	Carmellose sodiu...	13D22-N02	20892	40	1401187
Caelo	Carmellose sodiu...	14029211	21382	40	20140127
Caelo	Carmellose sodiu...	13299310	21432	40	20131002
Caelo	Carmellose sodiu...	161714	22645	40	20160713*

Validation samples

A total of 213 227 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 *Carmellose sodium* (400/450/500/600/1600 mPa · s). These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

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

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

- 100 spectra of 3 reference samples from the substance/substance group *Carmellose sodium* (400/450/500/600/1600 mPa · s).

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Carmellose sodium (400/450/5...	pending	20144	40
zu erfassen	Carmellose sodium (400/450/5...	pending	20147	40
Caelo	Carmellose sodium (400/450/5...	13299310	21432 [†]	20

- 81 248 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

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

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

- 43 spectra from 20 *Apo-Ident* customers from 30 batches from the substance/substance group *Carmellose sodium* (400/450/500/600/1600 mPa · s).

Supplier	Substance	Batch	Spectra
Caelo	Carmellose sodium (400/450/5...	11124211	1
Caelo	Carmellose sodium (400/450/5...	12354416	3
Caelo	Carmellose sodium (400/450/5...	11124212	1
Bombastus	Carmellose sodium (400/450/5...	13104813	3
Caelo	Carmellose sodium (400/450/5...	13104810	2
Caelo	Carmellose sodium (400/450/5...	1315Q-03302	1
Phönix	Carmellose sodium (400/450/5...	12354416	1
Gehe 06.10.14	Carmellose sodium (400/450/5...	13299312	1
Caelo	Carmellose sodium (400/450/5...	13299302	2
Caelo	Carmellose sodium (400/450/5...	13G19-N02	1
Caelo	Carmellose sodium (400/450/5...	14149806	1
Caelo	Carmellose sodium (400/450/5...	14029201	1
Caelo	Carmellose sodium (400/450/5...	15123901	3
Caelo	Carmellose sodium (400/450/5...	15123908	2
Caelo	Carmellose sodium (400/450/5...	28051402	1
Fagron	Carmellose sodium (400/450/5...	15G03-Bo2-312862	1
Noweda	Carmellose sodium (400/450/5...	12354401	1
Caelo	Carmellose sodium (400/450/5...	13104802	2
Caelo	Carmellose sodium (400/450/5...	12079618	1
Caelo	Carmellose sodium (400/450/5...	11124218	1
Caelo	Carmellose sodium (400/450/5...	913M-03302	1
Caelo	Carmellose sodium (400/450/5...	12079615	1
Caelo	Carmellose sodium (400/450/5...	12255708	1
Caelo	Carmellose sodium (400/450/5...	12354408	3
Anzag/	Carmellose sodium (400/450/5...	21733	1
Caelo	Carmellose sodium (400/450/5...	12354403	1
Fagron	Carmellose sodium (400/450/5...	13D22-N02	1
Caelo	Carmellose sodium (400/450/5...	14029211	1
Gutenberg-Apotheke	Carmellose sodium (400/450/5...	4811E-03302	1
Sanacorp	Carmellose sodium (400/450/5...	AKD6	1
Caelo	Carmellose sodium (400/450/5...	12354418	1

- 55 958 spectra from 335 *Apo-Ident* customers from a total of 20 583 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Carmellose sodium* (400/450/500/600/1600 mPa · s) can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Carmellose sodium* (400/450/500/600/1600 mPa · s) and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (A/B/C).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	82	18	81 248
Type C	0	36	7	55 958

The substance/substance group *Carmellose sodium (400/450/500/600/1600 mPa · s)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	82.0000 % (> 79.0000 %)
Type C	100.0000 % (> 99.8622 %)	83.7209 % (> 76.7442 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20866	20866	0.00	50.83
20872	20872	0.00	57.46
20892	20892	0.00	59.48
21382	20872	8.30	54.63
21432	20866	9.37	39.24
22645	22645	0.00	27.04

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cellulose, microcrystalline**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20708-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cellulose, microcrystalline; Cellulosum microcristallinum; Cellulosum microcrystallisatum

Special notes

When selecting the *Cellulose, microcrystalline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cellulose, microcrystalline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cellulose, micro...	12C23-N06	20708	70	1403080
Euro OTC	Cellulose, micro...	1201004-01	20728	40	20120201
Euro OTC	Cellulose, micro...	1211037-01	21080	40	20121207
Euro OTC	Cellulose, micro...	1211037-01	21085	40	20121207
Euro OTC	Cellulose, micro...	1507022	21857	40	0000010638
Euro OTC	Cellulose, micro...	1604029	22559	40	20160512*
Fagron	Cellulose, micro...	16B24-B11-323324	22896	40	20160311

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 7 reference samples from the substance/substance group *Cellulose, microcrystalline*. These samples are listed above in the [calibration samples](#) section.
- 75 568 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Cellulose, microcrystalline*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cellulose, microcrystalline	1507022	21857 [†]	20
Euro OTC	Cellulose, microcrystalline	1607042	22794	40
Euro OTC	Cellulose, microcrystalline	1604029-01	22815	40
Euro OTC	Cellulose, microcrystalline	1610030	22876	40

- 81 208 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 25 spectra from 17 *Apo-Ident* customers from 15 batches from the substance/substance group *Cellulose, microcrystalline*.

Supplier	Substance	Batch	Spectra
Euro OTC	Cellulose, microcrystalline	1211037-01	3
Euro OTC	Cellulose, microcrystalline	1309001-02	1
Euro OTC	Cellulose, microcrystalline	1309001-01	2
Euro OTC	Cellulose, microcrystalline	1410002-01	4
Euro OTC	Cellulose, microcrystalline	135010001	1
Euro OTC	Cellulose, microcrystalline	700204	1
Fagron	Cellulose, microcrystalline	2013M-01350	1
Fagron	Cellulose, microcrystalline	15C03-B06-305242	1
Fagron	Cellulose, microcrystalline	9K10-N10	1
Euro OTC	Cellulose, microcrystalline	150702201	1
Euro OTC	Cellulose, microcrystalline	1604029-01	1
EuRho	Cellulose, microcrystalline	1201004-02	1
Euro OTC	Cellulose, microcrystalline	1201004-02	2
Phnoix	Cellulose, microcrystalline	1211037-01	1
Koisser	Cellulose, microcrystalline	E0790	1
Euro OTC	Cellulose, microcrystalline	121103701	1
Fagron	Cellulose, microcrystalline	13A03-N01	1
Phoenix	Cellulose, microcrystalline	1309001-02	1

- 55 976 spectra from 335 *Apo-Ident* customers from a total of 20 596 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cellulose, microcrystalline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cellulose, microcrystalline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	75 568
Type B	0	140	0	81 208
Type C	0	25	0	55 976

The substance/substance group *Cellulose, microcrystalline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 76.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20708	20708	0.00	53.17
20728	20708	3.15	52.96
21080	21857	6.79	49.79
21085	21857	6.26	50.53
21857	21857	0.00	52.16
22559	22559	0.00	63.91
22896	21857	2.85	51.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cetostearyl alcohol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20555-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cetostearyl alcohol; Alcohol cetylicus; Alcohol cetylicus et stearylicus; Alcohol cetylicus et stearylicus emulsificans A; Alcohol cetylstearylicus; Alcohol cetylstearylicus emulsificans A; Cetyl alcohol; Emulgade® 1000 NI; Emulsifying cetostearyl alcohol (type A)

Special notes

When selecting the *Cetostearyl alcohol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cetostearyl alcohol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cetostearyl alco...	12C21-N09	20555	40	20120326
Fagron	Emulgade® 1000 NI	12H07-N06	20738	30	20120905
Caelo	Cetyl alcohol	13096901	20896	40	1405179
Fagron	Cetostearyl alco...	13C13-N13	20968	40	1402265

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Emulgade® 1000 NI	13C05-B40-289262	21054	40	1408003
Fagron	Emulsifying ceto...	13L17-B05	21279	40	1505070
Caelo	Cetostearyl alco...	14054504	21314	40	20140226
Caelo	Cetyl alcohol	13286502	21318	40	20130925
Caelo	Emulsifying ceto...	13233005	21319	30	1506057
Caelo	Emulgade® 1000 NI	14055001	21381	40	20140225
Caelo	Emulsifying ceto...	13233005	21434	40	20130816
Caelo	Cetyl alcohol	13286502	21435	40	20130925
Caelo	Cetostearyl alco...	14054504	21442	40	20140226
Caelo	Emulsifying ceto...	14322505	21830	40	20141031
Euro OTC	Emulsifying ceto...	1510043	21998	40	20151124*
Euro OTC	Emulsifying ceto...	1504010-01	22264	40	20150423
Caelo	Cetyl alcohol	15323301	22266	40	AR-16-FG-008835-01
Caelo	Emulsifying ceto...	153857	22332	40	20151202*
Caelo	Emulsifying ceto...	153856	22334	40	20160210*
Caelo	Emulgade® 1000 NI	15277504	22390	40	20150828
Caelo	Emulgade® 1000 NI	160804	22397	40	20160323*
Caelo	Cetyl alcohol	161063	22398	40	20160420*
Caelo	Cetyl alcohol	161063	22403	40	20160420*
Euro OTC	Cetyl alcohol	1508014-01	22611	40	20150821

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 940 spectra of 24 reference samples from the substance/substance group *Cetostearyl alcohol*. These samples are listed above in the [calibration samples](#) section.
- 74 938 spectra from a total of 1556 batches from further 380 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 880 spectra of 26 reference samples from the substance/substance group *Cetostearyl alcohol*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cetostearyl alcohol	82753089	20113	60
Caelo	Emulsifying cetostearyl alco...	10040502	20163	40
Caelo	Cetyl alcohol	10144209	20283	30
Caelo	Emulsifying cetostearyl alco...	11L22-N09	20513	40
Fagron	Emulsifying cetostearyl alco...	12C30-N01	20586	40
Fagron	Emulsifying cetostearyl alco...	11291113	20636	40
Fagron	Emulgade [®] 1000 NI	12H07-N06	20738 [†]	10
Caelo	Emulsifying cetostearyl alco...	13233005	21434 [†]	20
Caelo	Cetyl alcohol	13286502	21435 [†]	20
Caelo	Cetostearyl alcohol	14054504	21442 [†]	20
Caelo	Emulsifying cetostearyl alco...	14322505	21830 [†]	20
Euro OTC	Emulsifying cetostearyl alco...	1510043	21998 [†]	20
Euro OTC	Emulsifying cetostearyl alco...	1504010-01	22264 [†]	20
Caelo	Cetyl alcohol	15323301	22266 [†]	20
Caelo	Emulsifying cetostearyl alco...	153857	22331	60
Caelo	Emulsifying cetostearyl alco...	153857	22332 [†]	20
Caelo	Emulsifying cetostearyl alco...	153856	22333	60
Caelo	Emulsifying cetostearyl alco...	153856	22334 [†]	20
Caelo	Emulgade [®] 1000 NI	160804	22395	40
Caelo	Emulgade [®] 1000 NI	160804	22396	40
Caelo	Cetyl alcohol	161063	22399	40
Caelo	Cetyl alcohol	161063	22400	40
Caelo	Cetyl alcohol	161063	22401	40
Caelo	Cetyl alcohol	161063	22402	40
Euro OTC	Emulsifying cetostearyl alco...	1604013	22540	40
Euro OTC	Emulsifying cetostearyl alco...	1701031	22999	40

- 80 468 spectra from a total of 1927 batches from further 617 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 411 spectra from 149 *Apo-Ident* customers from 158 batches from the substance/substance group *Cetostearyl alcohol*.

Supplier	Substance	Batch	Spectra
Caelo	Emulsifying cetostearyl alco...	13233008	1
Fagron	Emulsifying cetostearyl alco...	12L19-N03	8
Fagron	Emulsifying cetostearyl alco...	13F07-N05	10
Fagron	Emulsifying cetostearyl alco...	13L17-B05-289805	6
Caelo	Emulsifying cetostearyl alco...	13352102	1
Fagron	Emulsifying cetostearyl alco...	13L17-B05	2
Caelo	Emulsifying cetostearyl alco...	14322505	8
Caelo	Emulsifying cetostearyl alco...	14158201	5
Fagron	Cetostearyl alcohol	14G31-B03	1
Caelo	Emulsifying cetostearyl alco...	15271402	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
Sanacorp	Emulsifying cetostearyl alco...	15090701	1
Caelo	Emulsifying cetostearyl alco...	15090706	2
Euro OTC	Emulsifying cetostearyl alco...	15271403	1
Caelo	Emulsifying cetostearyl alco...	15271405	4
Fagron	Emulsifying cetostearyl alco...	15C31-B99-307062	3
Fagron	Cetostearyl alcohol	3414E-01078	1
Caelo	Cetyl alcohol	P134/14	1
Fagron	Cetostearyl alcohol	12C30-N01	3
Caelo	Cetyl alcohol	13210504	11
Fagron	Emulsifying cetostearyl alco...	9652865	2
Fagron	Cetostearyl alcohol	7886542	1
Sanacorp	Emulsifying cetostearyl alco...	12J29-N04	1
Fagron	Emulsifying cetostearyl alco...	12G02-N04	6
Fagron	Emulsifying cetostearyl alco...	12J29-N04	4
A.H.D.	Emulsifying cetostearyl alco...	12L19-N03	2
Caelo	Emulsifying cetostearyl alco...	13144105	7
Caelo	Emulsifying cetostearyl alco...	13233002	1
Caelo	Cetyl alcohol	12271103	6
Caelo	Cetyl alcohol	13286502	3
Caelo	Cetyl alcohol	14141501	1
Caelo	Cetyl alcohol	14262204	6
Caelo	Cetyl alcohol	14349101	10
Caelo	Cetyl alcohol	15323301	3
EuRho Anzag ek:3,47EUR	Cetyl alcohol	110505501	1
Caelo	Cetyl alcohol	15323311	1
Caelo	Cetyl alcohol	12018605	2
Caelo	Cetyl alcohol	11320702	3
Euro OTC	Cetyl alcohol	1105055-01	1
EuRho	Cetyl alcohol	1206020-01	1
Caelo	Cetyl alcohol	11153416	1
Finze	Cetyl alcohol	10321703	1
Euro OTC	Cetyl alcohol	1206020-01	1
Euro OTC	Cetyl alcohol	1211002-01	3
Caelo	Cetyl alcohol	12338604	6
Caelo	Cetyl alcohol	13096901	4
Fagron	Cetyl alcohol	12A-02N12	1
Phonix	Cetyl alcohol	13210504	1
Caelo	Cetyl alcohol	13096904	2
Phönix	Cetyl alcohol	13096901	1
Sanacorpaelo /Sanacorp	Cetyl alcohol	1AKS11	1
Caelo	Cetyl alcohol	20250112-1	1
Caelo	Emulsifying cetostearyl alco...	12065709	6
Caelo	Cetostearyl alcohol	13018305	7
Euro OTC	Cetostearyl alcohol	130503501	1
Berkel AHK	Cetostearyl alcohol	13144105	1
Caelo	Cetostearyl alcohol	13144105	2
Fagron	Cetostearyl alcohol	13F07-N05	2
Fagron	Cetostearyl alcohol	13L17-B05-289805	2
Fagron	Cetostearyl alcohol	13L17-B05-289806	3
ahd/lamotte	Cetostearyl alcohol	13210504	1
Fagron	Cetostearyl alcohol	13L17-B05	1
Caelo	Cetostearyl alcohol	13206206	3
Fagron	Cetostearyl alcohol	13L17-B05-294999	1
Euro OTC	Cetostearyl alcohol	1404019-01	2
Euro OTC	Cetostearyl alcohol	1404019-02	1
Caelo	Cetostearyl alcohol	14054508	3
Caelo	Cetostearyl alcohol	14158201	4
Caelo	Cetostearyl alcohol	14054504	3
Berkel AHK	Cetostearyl alcohol	14158201	2
Gehe	Cetostearyl alcohol	14054504	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Cetostearyl alcohol	14215007	6
Caelo	Cetostearyl alcohol	14346201	3
Phoenix	Cetostearyl alcohol	14322505	2
Euro OTC	Cetostearyl alcohol	150401001	1
Caelo	Cetostearyl alcohol	15090701	2
Fagron	Cetostearyl alcohol	14G31-B03-297611	1
Caelo	Cetostearyl alcohol	15271405	1
Caelo	Cetostearyl alcohol	15272702	2
Caelo	Cetostearyl alcohol	15272709	2
Caelo	Cetostearyl alcohol	15272717	1
Bombastus	Cetostearyl alcohol	295148	1
Bombastus	Cetostearyl alcohol	300132	1
Sanacorp	Cetostearyl alcohol	575778	1
Fagron	Cetostearyl alcohol	15D24-B02-308261	2
Fagron	Cetostearyl alcohol	8256792	3
Fagron	Cetostearyl alcohol	9652865	1
Euro OTC	Cetostearyl alcohol	1107035-01	1
Caelo	Cetostearyl alcohol	11302101	2
Caesar & Loretz GmbH, 4...	Cetostearyl alcohol	11302101	1
Fagron	Cetostearyl alcohol	10F17-N02	1
Fagron	Cetostearyl alcohol	11E17-N13	1
Fagron	Cetostearyl alcohol	11f30-n11	1
Fagron	Cetostearyl alcohol	11K17-N02	1
Caelo	Cetostearyl alcohol	11K17-N02	1
Euro OTC	Cetostearyl alcohol	1204015-01	1
Caelo	Cetostearyl alcohol	12025301	2
Euro OTC	Cetostearyl alcohol	1212019-01	1
Caelo	Cetostearyl alcohol	12021304	1
Fagron	Cetostearyl alcohol	12E30-N13	1
Fagron	Cetostearyl alcohol	12g02-n04	1
Caelo	Cetostearyl alcohol	12065705	1
Caelo	Cetostearyl alcohol	12065709	1
Fagron	Cetostearyl alcohol	12G02-N04	9
Fagron	Cetostearyl alcohol	12J17-N05	1
Fagron	Cetostearyl alcohol	12K22-N03	3
Fagron	Cetostearyl alcohol	12J29-N04	1
Fagron	Cetostearyl alcohol	12J17-N05	1
Fagron	Cetostearyl alcohol	12L19-N03	1
Caelo	Cetostearyl alcohol	13018306	1
Euro OTC	Cetostearyl alcohol	1305035-01	1
Caelo	Cetostearyl alcohol	1314405	1
Fagron	Cetostearyl alcohol	13C13-N13	1
Euro OTC	Cetostearyl alcohol	20270912-2	1
Caelo	Cetostearyl alcohol	14061317	1
Caesar/Noweda	Cetostearyl alcohol	2911E-01077	1
Caelo	Emulgade® 1000 NI	15113703	1
Caelo	Emulgade® 1000 NI	14055002	1
Caelo	Emulgade® 1000 NI	12032002	1
Caelo	Emulgade® 1000 NI		1
AHD	Emulgade® 1000 NI	8073743	1
Caelo	Emulgade® 1000 NI	13092401	1
Euro OTC	Emulsifying cetostearyl alco...	10836573	1
Caelo	Emulsifying cetostearyl alco...	5011505	1
Caesar & Loretz GmbH	Emulsifying cetostearyl alco...	13233008	1
PHOENIX am07.04.2014	Emulsifying cetostearyl alco...	13F07-N05	1
Sanacorp	Emulsifying cetostearyl alco...	13F07-N05	1
Caelo	Emulsifying cetostearyl alco...	13233005	6
Fagron	Emulsifying cetostearyl alco...	13I06-N04	1
Fagron	Emulsifying cetostearyl alco...	13L17B05289805	1
Alliance Health 24.07.2...	Emulsifying cetostearyl alco...	13L17-B05-289805	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Emulsifying cetostearyl alco...	13L17-B05-289806	3
Fagron	Emulsifying cetostearyl alco...	13L17-B05-294999	3
Caelo	Emulsifying cetostearyl alco...	13L17-B05-289806	1
Euro OTC	Emulsifying cetostearyl alco...	1404019-01	1
Caelo	Emulsifying cetostearyl alco...	14156201	1
Fagron	Emulsifying cetostearyl alco...	14G31-B03	1
Fagron	Emulsifying cetostearyl alco...	14G31-B03-297610	3
alliance health. 05.05....	Emulsifying cetostearyl alco...	14G31-B03-297610	1
Euro OTC	Emulsifying cetostearyl alco...	14G31-B03-297610	1
Fagron	Emulsifying cetostearyl alco...	14G31-B03-305612	5
Caelo	Emulsifying cetostearyl alco...	15090701	6
Caelo	Emulsifying cetostearyl alco...	15090703	2
Caesar&Loretz/Noweda	Emulsifying cetostearyl alco...	15271405	1
Fagron	Emulsifying cetostearyl alco...	15C31-B00-307062	1
Caelo	Emulsifying cetostearyl alco...	15385602	1
Fagron	Emulsifying cetostearyl alco...	15D24-B02	1
Fagron	Emulsifying cetostearyl alco...	16B23-B07-318218	1
Fagron	Emulsifying cetostearyl alco...	15D24-B02-311993	3
Fagron	Emulsifying cetostearyl alco...	16B23-B07-320384	2
Caelo	Emulsifying cetostearyl alco...	23051503	1
Caelo	Emulsifying cetostearyl alco...		1
Bombastus	Emulsifying cetostearyl alco...	288691	2
Bombastus	Emulsifying cetostearyl alco...	300132	1
Bombastus	Emulsifying cetostearyl alco...	295148	1
Fagron	Emulsifying cetostearyl alco...	8256792	2
GEHE	Emulsifying cetostearyl alco...	8440094	1
Fagron	Emulsifying cetostearyl alco...	14175700	1
Euro OTC	Emulsifying cetostearyl alco...	1003050-01	1
Caelo	Emulsifying cetostearyl alco...	11291103	2
Caesar &Loretz GmbH	Emulsifying cetostearyl alco...	12065703	1
Fagron	Emulsifying cetostearyl alco...	11L22-N09	1
Caelo	Emulsifying cetostearyl alco...	12331402	5
Caelo	Emulsifying cetostearyl alco...	12331407	3
Fagron	Emulsifying cetostearyl alco...	12602-N04	1
Caelo	Emulsifying cetostearyl alco...	12C30-N01	1
Fagron	Emulsifying cetostearyl alco...	12G02N04	1
Anzag	Emulsifying cetostearyl alco...	12G02-N04	1
Caelo	Emulsifying cetostearyl alco...	13144104	3
Noweda	Emulsifying cetostearyl alco...	13144104	1
Phönix	Emulsifying cetostearyl alco...	1323305	1
Caesar&loretz,Phoenix	Emulsifying cetostearyl alco...	14158201	1
Caelo	Emulsifying cetostearyl alco...	15271403	4
Sanacorp	Emulsifying cetostearyl alco...	13I06-N04	1
Euro OTC	Emulsifying cetostearyl alco...	15271410	1
Fagron	Emulsifying cetostearyl alco...	15D24-B02-308261	1
Fagron	Emulsifying cetostearyl alco...	20260712-2	1
Caelo	Emulsifying cetostearyl alco...	25/AKD1	1
Bombastus	Emulsifying cetostearyl alco...	278418	1
Noweda	Emulsifying cetostearyl alco...	13065576	1
Euro OTC	Emulsifying cetostearyl alco...	1404019-02	1
Euroh/Noweda	Emulsifying cetostearyl alco...	1504010-01	1
Caelo	Emulsifying cetostearyl alco...	15271410	1
Caelo	Emulsifying cetostearyl alco...	14322512	1
Phönix	Emulsifying cetostearyl alco...	15C31-B99-307062	1
Fagron	Emulsifying cetostearyl alco...	2215I-01078	1
Caelo	Emulsifying cetostearyl alco...	23091402	1
Caelo	Cetyl alcohol	1212E-01076	1
Caelo	Emulsifying cetostearyl alco...	Unbekannt	1
Fagron	Emulsifying cetostearyl alco...	3013M-01078	1
Fagron	Emulsifying cetostearyl alco...	11499002	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Emulsifying cetostearyl alco...	265360	1
Caelo	Emulsifying cetostearyl alco...	2011404	1
Caelo	Emulsifying cetostearyl alco...	11291101	1
Caelo	Emulsifying cetostearyl alco...	11009204	1
Caelo	Emulsifying cetostearyl alco...	11291104	1
Caesar/Noweda	Emulsifying cetostearyl alco...	11343405	1
Noweda	Emulsifying cetostearyl alco...	12065705	1
Caelo	Emulsifying cetostearyl alco...	12065703	1
Caesar/Noweda	Emulsifying cetostearyl alco...	12065707	1
Caelo	Emulsifying cetostearyl alco...	12134203	1
Caelo	Emulsifying cetostearyl alco...	12229402	2
Euro OTC	Emulsifying cetostearyl alco...	1305035-01	2
Phoenix 26.11.12	Emulsifying cetostearyl alco...	13144105	1
Caelo	Emulsifying cetostearyl alco...	12231402	1
Caelo	Emulsifying cetostearyl alco...	13233001	1
Caelo	Emulsifying cetostearyl alco...	18081201	1
Caelo	Emulsifying cetostearyl alco...	21121-01078	1
Caelo	Emulsifying cetostearyl alco...	25051201	1
Fagro	Emulsifying cetostearyl alco...	5211Q-01078	1
Caelo	Emulsifying cetostearyl alco...	24101305	1
Sanacorp	Cetostearyl alcohol	13206206	1

- 55 590 spectra from 335 *Apo-Ident* customers from a total of 20 455 batches from a further 680 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cetostearyl alcohol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cetostearyl alcohol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	940	0	74 938
Type B	0	867	13	80 468
Type C	0	402	9	55 590

The substance/substance group *Cetostearyl alcohol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 99.3617 %)
Type B	100.0000 % (> 99.9853 %)	98.5227 % (> 98.1818 %)
Type C	100.0000 % (> 99.8622 %)	97.8102 % (> 97.0803 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20555	20968	9.47	48.80
20738	21054	4.19	48.71
20896	20896	0.00	44.55
20968	20968	0.00	48.37
21054	21054	0.00	40.23
21279	21279	0.00	52.26
21314	21998	8.78	48.10
21318	20896	19.19	44.71
21319	21319	0.00	52.84
21381	22397	6.32	42.17
21434	21279	2.33	52.29
21435	20896	21.16	44.35
21442	22332	11.08	47.66
21830	21998	1.64	53.31
21998	21998	0.00	52.93
22264	22334	1.28	51.75
22266	22266	0.00	39.52
22332	22332	0.00	51.02
22334	22334	0.00	51.89
22390	21054	6.21	48.67
22397	22397	0.00	41.86
22398	22398	0.00	43.28
22403	22403	0.00	39.71
22611	22398	24.00	43.86

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Chloral hydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20322-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chloral hydrate; Chlorali hydras; Chloralum hydratum

Special notes

When selecting the *Chloral hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chloral hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chloral hydrate	11J05-N01	20322	40	AR-12-FG-009588-01
Fagron	Chloral hydrate	12C26-M04	20552	40	AR-13-FG-008605-01
Fagron	Chloral hydrate	13F06-N07	21231	40	20130626

Validation samples

A total of 213 227 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 *Chloral hydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Chloral hydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chloral hydrate	13213311	21309	40
Caelo	Chloral hydrate	15448318	22963	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 115 spectra from 57 *Apo-Ident* customers from 61 batches from the substance/substance group *Chloral hydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Chloral hydrate	3121403	1
Fagron	Chloral hydrate	12H06-N080160/161	1
Fagron	Chloral hydrate	12H06-N081114/1612	1
Caelo	Chloral hydrate	13002425	2
Caelo	Chloral hydrate	13002417	3
Caelo	Chloral hydrate	13213311	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Chloral hydrate	1403815	1
Caelo	Chloral hydrate	14038301	4
Caelo	Chloral hydrate	14038306	1
Caelo	Chloral hydrate	14038311	3
Caelo	Chloral hydrate	14218704	3
Euro OTC	Chloral hydrate	14218702	1
Phönix Gotha	Chloral hydrate	14038302	1
Caelo	Chloral hydrate	14218701	2
Caelo	Chloral hydrate	14218705	2
Caelo	Chloral hydrate	14218709	3
CAESAR-LORETZ /GEHE	Chloral hydrate	14218710	1
Sanacorp	Chloral hydrate	14218705	1
Caelo	Chloral hydrate	14218714	2
Fagron	Chloral hydrate	14218712	1
Fagron	Chloral hydrate	14218719	1
Caelo	Chloral hydrate	14218712	1
Caelo	Chloral hydrate	14218713	1
Caelo	Chloral hydrate	14218719	2
Noweda 05.08.2015	Chloral hydrate	15083701	2
Caelo	Chloral hydrate	15083703	5
Caelo	Chloral hydrate	15166501	1
Caelo	Chloral hydrate	15166503	2
Caelo	Chloral hydrate	15166505	4
Caelo	Chloral hydrate	15166507	1
Caelo	Chloral hydrate	15166506	3
Caelo	Chloral hydrate	15166508	2
Caelo	Chloral hydrate	15448306	1
Caelo	Chloral hydrate	15166513	1
Ebert KKH 10.10.16	Chloral hydrate	15448308	1
Caelo	Chloral hydrate	15448312	2
Caelo	Chloral hydrate	17121402	1
Caelo	Chloral hydrate	414061	1
Fagron	Chloral hydrate	11J05-N01	1
FARGON	Chloral hydrate	10i14-n10	1
Caelo	Chloral hydrate	12017512	2
Caelo	Chloral hydrate	12017503	1
Caelo	Chloral hydrate	12017518	1
Fagron	Chloral hydrate	11D13-N07	1
Fagron	Chloral hydrate	12C26-M04	2
Fagron	Chloral hydrate	12C26-M05	1
Phönix,02.11.2012	Chloral hydrate	12C26-M06	1
Phönix,02.11.2012	Chloral hydrate	12C26-M05	1
Fagron	Chloral hydrate	12C26-M08	1
Fagron	Chloral hydrate	12H06N08	3
Fagron	Chloral hydrate	12H06-N080101/1612	1
Fagron	Chloral hydrate	12H06-N08	13
Anzag 17.01.2013	Chloral hydrate	12H06-N08	1
Sanacorp	Chloral hydrate	12H06-N08	1
Gehe	Chloral hydrate	12H06-N08	1
Fagron	Chloral hydrate	12H06-N080013/494	1
Caelo	Chloral hydrate	13d22-n11	1
Phönix Gotha	Chloral hydrate	13F06-N07	2
Fargon/ Noweda	Chloral hydrate	13F06N07	1
Fagron	Chloral hydrate	13F06-N070631/786	1
Fagron	Chloral hydrate	13F06-N07	2
Caelo	Chloral hydrate	14101307	1
Caelo	Chloral hydrate	25021401	1
FARGON	Chloral hydrate		1
Caelo	Chloral hydrate	15448303	1
GEHE	Chloral hydrate	21022172/4	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Anzag	Chloral hydrate	12C26M04	1
Caelo	Chloral hydrate	13002405	1

- 55 886 spectra from 335 *Apo-Ident* customers from a total of 20 551 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chloral hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chloral hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	0	81 268
Type C	0	114	1	55 886

The substance/substance group *Chloral hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	99.1304 % (> 96.5217 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20322	20322	0.00	52.77
20552	20552	0.00	52.70
21231	20322	10.47	52.98

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Chloramphenicol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20097-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chloramphenicol; Chloramphenicolum

Special notes

When selecting the *Chloramphenicol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chloramphenicol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chloramphenicol	11F20-N05	20777	90	1412249
Caelo	Chloramphenicol	11370716	20787	40	20120202
Caelo	Chloramphenicol	12248507	20807	40	20120831
Euro OTC	Chloramphenicol	1209019-02	20813	60	20130408
Euro OTC	Chloramphenicol	1209019-02	20815	60	20130408
Fagron	Chloramphenicol	13A11-N02	20822	30	20130125

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chloramphenicol	13080924	21701	40	1509287
Euro OTC	Chloramphenicol	1407043-01	21752	40	20140903
Fagron	Chloramphenicol	14E01-B02-308559	21910	40	20140513
Caelo	Chloramphenicol	14346908	21988	40	20150115
Euro OTC	Chloramphenicol	1602002	22367	30	20160309*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 510 spectra of 11 reference samples from the substance/substance group *Chloramphenicol*. These samples are listed above in the [calibration samples](#) section.
- 75 368 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 7 reference samples from the substance/substance group *Chloramphenicol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chloramphenicol	13080924	21701 [†]	20
Euro OTC	Chloramphenicol	1407043-01	21752 [†]	20
Fagron	Chloramphenicol	14E01-B02-308559	21910 [†]	20
Caelo	Chloramphenicol	14346908	21988 [†]	20
Euro OTC	Chloramphenicol	1602002	22367 [†]	15
Caelo	Chloramphenicol	15358906	22961	40
Fagron	Chloramphenicol	16I12-B07-327124	22962	40

- 81 173 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 597 spectra from 200 *Apo-Ident* customers from 153 batches from the substance/substance group *Chloramphenicol*.

Supplier	Substance	Batch	Spectra
Caelo	Chloramphenicol	3081602	1
Caelo	Chloramphenicol	93323801	1
Caelo	Chloramphenicol	11370706	3
Caelo	Chloramphenicol	11370711	13
Euro OTC	Chloramphenicol	120250	1
Caelo	Chloramphenicol	1203012-02	1
Euro OTC	Chloramphenicol	1203012-02	14
Euro OTC	Chloramphenicol	1209010-02	4
Caelo	Chloramphenicol	12248520	6
Euro OTC	Chloramphenicol	1209019-02	10
Caelo	Chloramphenicol	12248524	8
Caelo	Chloramphenicol	12248525	4
Euro OTC	Chloramphenicol	1302024-01	9
Caesar&Loretz GmbH/Anzag	Chloramphenicol	1308017-01	1
Fagron	Chloramphenicol	12B13-N06	8
Euro OTC	Chloramphenicol	1302024-02	7
EuRho/Phönix	Chloramphenicol	1308017-01	1
Euro OTC	Chloramphenicol	1308017-01	7
Euro OTC	Chloramphenicol	130801701	1
Caelo	Chloramphenicol	1308017-01	1
PHOENIX 25.04.2014	Chloramphenicol	1308017-02	2
euroct/gehe	Chloramphenicol	1308017-01	2
Euro OTC	Chloramphenicol	1308017-02	10
Euro OTC	Chloramphenicol	130801702	1
Euro/ Sanacorp	Chloramphenicol	1308017-02	1
Gehe	Chloramphenicol	1308017-02	1
ANZAG	Chloramphenicol	1308017-02	1
Caelo	Chloramphenicol	13080903	9
Caelo	Chloramphenicol	13080303	1
Caelo	Chloramphenicol	13080904	4
AHD	Chloramphenicol	13080904	1
Caelo	Chloramphenicol	13080907	10
Phönix Gotha	Chloramphenicol	13080907	1
noweda	Chloramphenicol	13080908	1
Nanjing Baijingyu Pharm...	Chloramphenicol	13080908	2
Caelo	Chloramphenicol	13080908	2
Caelo	Chloramphenicol	13080915	1
Caelo	Chloramphenicol	13080917	3
Caelo	Chloramphenicol	13080918	1
Caelo	Chloramphenicol	13080923	9
Caelo	Chloramphenicol	13080921	1
Phönix	Chloramphenicol	13080921	1
Caelo	Chloramphenicol	13080924	10
Caelo	Chloramphenicol	13080925	8
Euro OTC	Chloramphenicol	13111410	1
Fagron	Chloramphenicol	13A11-N02	8
Phönix	Chloramphenicol	13A1-802	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Chloramphenicol	13A31-B02	8
Caelo	Chloramphenicol	13A31-B02-286709	1
Fagron	Chloramphenicol	13A31-B02-286709	3
Caelo	Chloramphenicol	13A31-B02-286708	3
Gutenberg-Apotheke	Chloramphenicol	13A31-B02-286710	1
Fagron	Chloramphenicol	13A31-B02-290300	1
Fagron	Chloramphenicol	13A31-B02-290263	1
Euro OTC	Chloramphenicol	1407043	1
Caelo	Chloramphenicol	140704301	2
Euro OTC	Chloramphenicol	1407043-01	13
Euro OTC	Chloramphenicol	140704301	3
Northeast General	Chloramphenicol	1407043-01	1
Caelo	Chloramphenicol	1407043-01	1
Caelo	Chloramphenicol	14346901	1
Caelo	Chloramphenicol	14346903	1
Noweda	Chloramphenicol	14346901	2
Caelo	Chloramphenicol	14346904	2
Caelo	Chloramphenicol	14346906	3
Caelo	Chloramphenicol	14346907	8
Caelo	Chloramphenicol	14346908	4
Caelo	Chloramphenicol	14346910	4
Noweda	Chloramphenicol	14346910	1
Caelo	Chloramphenicol	14346911	5
AHD	Chloramphenicol	14346912	1
Caelo	Chloramphenicol	14346912	2
Caelo	Chloramphenicol	14346913	3
Caelo	Chloramphenicol	14346914	2
Caelo	Chloramphenicol	14346918	8
Caelo	Chloramphenicol	14346917	2
Fagron	Chloramphenicol	14E01-B02	4
Caelo	Chloramphenicol	14346924	1
Caelo	Chloramphenicol	14346922	1
Fagron	Chloramphenicol	14E01-B02-296623	1
Caelo	Chloramphenicol	14E01-B02-296623	1
Fagron	Chloramphenicol	14E01-B02-296624	6
Fagron	Chloramphenicol	14E01B02296624	1
Caelo	Chloramphenicol	14E01B02296624	1
Fagron	Chloramphenicol	14E01-B02-306146	6
Fagron	Chloramphenicol	14E01-B02-296625	1
Fagron	Chloramphenicol	14E01-B02-308559	5
Euro OTC	Chloramphenicol	1502036-01	13
Gehe 27.06.15/euro	Chloramphenicol	1502036-01	2
Euro OTC	Chloramphenicol	150203601	1
Euro OTG	Chloramphenicol	1502036-01	1
EuRho / 20	Chloramphenicol	1502036-01	1
Fagron	Chloramphenicol	1502036-01	1
Euro/Alliance Healthcare	Chloramphenicol	1502036-01	1
Caelo	Chloramphenicol	1502036-01	1
Euro OTC	Chloramphenicol	1502036-02	4
Northeast General/Noweda	Chloramphenicol	1502036-02	1
Euro OTC	Chloramphenicol	1502036-03	7
Euro OTC	Chloramphenicol	150203603	1
Caelo	Chloramphenicol	1502036-03	2
Phoe	Chloramphenicol	15358905	1
Caelo	Chloramphenicol	15358905	2
Caelo	Chloramphenicol	15358907	1
Fagron	Chloramphenicol	15358907	2
Euro OTC	Chloramphenicol	1602002-02	2
Euro OTC	Chloramphenicol	1602002-01	4
Caelo	Chloramphenicol	1602002-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Chloramphenicol	1602002-03	1
Sanacorp	Chloramphenicol	41/AKD24	1
Fagron	Chloramphenicol	DY00911233	4
Euro OTC	Chloramphenicol	DY130525	1
Fagron	Chloramphenicol	DY00912129	1
Caelo	Chloramphenicol	DY130525	1
Caelo	Chloramphenicol	4412Q-01259	1
Euro OTC	Chloramphenicol	DY00912128	2
AHDE 20.08.15	Chloramphenicol	DY00912128	1
Euro OTC	Chloramphenicol	T02-55/1407043-01	1
Caelo	Chloramphenicol	310311	1
Euro OTC	Chloramphenicol	314Q1259	1
Caelo	Chloramphenicol	9323807	1
Euro OTC	Chloramphenicol	1012013-01	2
Caelo	Chloramphenicol	10341703	1
Caelo	Chloramphenicol	10341707	1
Phönix	Chloramphenicol	10341716	1
Phönix	Chloramphenicol	10341710	1
Caelo	Chloramphenicol	10341711	2
Caelo	Chloramphenicol	10341717	1
Caelo	Chloramphenicol	11031402	1
Euro OTC	Chloramphenicol	1107002-01	2
Caelo	Chloramphenicol	1107002-01	1
Gehe	Chloramphenicol	1107002-02	2
ANZAG am 23.05.2012	Chloramphenicol	1107002-02	2
Euro OTC	Chloramphenicol	1107002-02	1
Euro OTC	Chloramphenicol	110700202	1
Caelo	Chloramphenicol	1137004	1
Noweda	Chloramphenicol	1137014	1
Caelo	Chloramphenicol	11370702	5
Caelo	Chloramphenicol	1137070	1
Caelo	Chloramphenicol	11370703	6
Caelo	Chloramphenicol	11370705	4
Anzag 15.11.2012	Chloramphenicol	11370705	1
Caelo	Chloramphenicol	11370707	1
Phönix Gotha	Chloramphenicol	11370711	1
Bombastus	Chloramphenicol	11370711	1
Anzag ek:2.98EUR 25.08.12	Chloramphenicol	11370711	1
Caesar & Loretz GmbH	Chloramphenicol	11370711	1
Anzag, 24.10.2012	Chloramphenicol	11370711	2
Klenk	Chloramphenicol	11370711	1
Caelo	Chloramphenicol	11370713	3
Caelo	Chloramphenicol	11370712	2
Caelo	Chloramphenicol	11370714	2
Noweda	Chloramphenicol	11370712	1
Caelo	Chloramphenicol	11370715	1
Caelo	Chloramphenicol	11370716	5
Caelo	Chloramphenicol	11370717	2
Caelo	Chloramphenicol	1137714	1
Fagron	Chloramphenicol	11J14-N03	1
Fagron	Chloramphenicol	1202500003	1
Euro OTC	Chloramphenicol	1203012-01	6
Kehr	Chloramphenicol	1203012-01	1
Gehe	Chloramphenicol	1203012-01	1
Kehr	Chloramphenicol	1203012-02	1
Euro OTC	Chloramphenicol	1209019-01	9
Euro OTC	Chloramphenicol	1203012-12	1
Caelo	Chloramphenicol	12072606	1
Anzag 12.03.2013	Chloramphenicol	1209019-01	2
Gehe	Chloramphenicol	1209019-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Chloramphenicol	1209019-02	1
Euro OTC	Chloramphenicol	120901902	3
Alliance Health	Chloramphenicol	1209019-02	1
Caelo	Chloramphenicol	12101302	1
Caelo	Chloramphenicol	12248501	15
Phönix Gotha	Chloramphenicol	12248501	1
Phönix 11.03.13	Chloramphenicol	12248501	1
vdl	Chloramphenicol	12248501	1
GEHE	Chloramphenicol	12248501	1
Anzag 03.04.13 ek: 3,18EUR	Chloramphenicol	12248501	1
Sanacorp	Chloramphenicol	12248501	1
Caelo	Chloramphenicol	12248505	4
Caelo	Chloramphenicol	12248506	8
Caelo	Chloramphenicol	12248507	8
AHD	Chloramphenicol	12248507	1
Sanacorp	Chloramphenicol	12248507	1
Caelo	Chloramphenicol	12248509	12
Noweda	Chloramphenicol	12248509	1
EuRho/Phönix	Chloramphenicol	123012-01	1
Phönix 11.11.2014	Chloramphenicol	12448509	1
Fagron	Chloramphenicol	12A11-N02	1
Noweda	Chloramphenicol	12B13-N06	1
Fagron	Chloramphenicol	12F01-N23	1
Fagron	Chloramphenicol	12G02-N01	11
Caelo	Chloramphenicol	12G02-N01	2
Noweda	Chloramphenicol	12G02-N01	1
Caelo	Chloramphenicol	12g02n01	1
Fagron	Chloramphenicol	12L11-N06	10
Caelo	Chloramphenicol	1302024-01	1
Phönix	Chloramphenicol	1302024-01	1
Caelo	Chloramphenicol	1302024-02	2
Euro OTC	Chloramphenicol	1302034-01	1
Euro OTC	Chloramphenicol		2
Caelo	Chloramphenicol	130416-1	1
Caelo	Chloramphenicol	130416-2	1
Caelo	Chloramphenicol	13080902	1
Phoenix	Chloramphenicol	13080903	1
Phönix	Chloramphenicol	13A11-N02	5
FARGON	Chloramphenicol	13a11-n02	1
Fagron	Chloramphenicol	13A11N02	1
ADH, 11.10.2013	Chloramphenicol	13A11-N02	1
Caelo	Chloramphenicol	13A31-B02	1
Fagron	Chloramphenicol	13A31-B02-286708	1
Euro OTC	Chloramphenicol	1509211259	1
Phönix	Chloramphenicol	1436907	1
Caelo	Chloramphenicol	20102012J1	1
Euro OTC	Chloramphenicol	2121211203012-0	1
Caelo	Chloramphenicol	3125204	1
Caelo	Chloramphenicol	28011401	1
Northeast Gen	Chloramphenicol	DY122127	1
Caelo	Chloramphenicol	70777297	1
Caelo	Chloramphenicol	4712Q-01259	1
Sanacorp	Chloramphenicol	41/AKD23	1
Gatt-Koller / Phoenix	Chloramphenicol	5615/12115211	1
Caelo	Chloramphenicol	DY00911233	1
Caelo	Chloramphenicol	11/14-N03	2
EUro/AHD	Chloramphenicol	1209019-01	1
EUro/AHD	Chloramphenicol	1209019-02	1
AHD	Chloramphenicol	12248509	1
Fragon	Chloramphenicol	12G02-N01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Chloramphenicol	1G02N01	1
GEHE	Chloramphenicol	21022141/2	1

- 55 404 spectra from 335 *Apo-Ident* customers from a total of 20 461 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chloramphenicol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chloramphenicol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	510	0	75 368
Type B	0	175	0	81 173
Type C	0	581	16	55 404

The substance/substance group *Chloramphenicol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8235 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.5714 %)
Type C	100.0000 % (> 99.8622 %)	97.3199 % (> 96.8174 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20777	20777	0.00	37.34
20787	22367	10.89	34.60

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20807	22367	7.10	35.35
20813	20777	1.78	37.01
20815	20777	2.20	37.35
20822	20777	2.29	36.97
21701	21701	0.00	34.77
21752	22367	7.11	36.87
21910	22367	3.92	36.02
21988	21701	5.53	34.22
22367	22367	0.00	36.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Chlorhexidine diacetate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20989-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlorhexidine diacetate; Chlorhexidini acetat; Chlorhexidinum aceticum

Special notes

When selecting the *Chlorhexidine diacetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chlorhexidine diacetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chlorhexidine di...	12142726	20989	40	1402685
Caelo	Chlorhexidine di...	12142727	21041	40	20120711
Fagron	Chlorhexidine di...	14I08-B02-306223	22280	40	20140922
Caelo	Chlorhexidine di...	154389	22456	40	20160309*
Fagron	Chlorhexidine di...	15J02-B08-322916	22947	40	20151104
Caelo	Chlorhexidine di...	15438913	23041	40	20160309*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chlorhexidine di...	154389	23042	40	2060309*
Caelo	Chlorhexidine di...	154389	23043	40	2060309*
Caelo	Chlorhexidine di...	15438909	23044	40	2060309*
Caelo	Chlorhexidine di...	154389	23048	40	2060309*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 400 spectra of 10 reference samples from the substance/substance group *Chlorhexidine diacetate*. These samples are listed above in the [calibration samples](#) section.
- 75 478 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 7 reference samples from the substance/substance group *Chlorhexidine diacetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chlorhexidine diacetate	9113914	20141	40
Fagron	Chlorhexidine diacetate	14I08-B02-306223	22280 [†]	20
Caelo	Chlorhexidine diacetate	154389	22456 [†]	20
Caelo	Chlorhexidine diacetate	15438914	22900	40
Fagron	Chlorhexidine diacetate	15J02-B08-322916	22946	40
Caelo	Chlorhexidine diacetate	15438914	22951	40
Caelo	Chlorhexidine diacetate	152610	23045	40

- 81 108 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 202 spectra from 124 *Apo-Ident* customers from 61 batches from the substance/substance group *Chlorhexidine diacetate*.

Supplier	Substance	Batch	Spectra
Caelo	Chlorhexidine diacetate	9113904	2
keine Angabe	Chlorhexidine diacetate	11204402	2
Caelo	Chlorhexidine diacetate	11204406	2
Caelo	Chlorhexidine diacetate	12142725	6
Caelo	Chlorhexidine diacetate	12142726	8
Caelo	Chlorhexidine diacetate	12142727	7
Noweda	Chlorhexidine diacetate	12142727	1
Caelo	Chlorhexidine diacetate	12142734	9
Großhandel	Chlorhexidine diacetate	12142734	1
Phoenix	Chlorhexidine diacetate	12142734	1
GEHE	Chlorhexidine diacetate	12142734	1
Caelo	Chlorhexidine diacetate	13177001	2
Caelo	Chlorhexidine diacetate	13177002	7
Cealo	Chlorhexidine diacetate	13177002	2
Phoenix	Chlorhexidine diacetate	13177002	1
Caelo	Chlorhexidine diacetate	13177007	13
Medichem S.A. ES/Noweda	Chlorhexidine diacetate	13177007	1
Caelo	Chlorhexidine diacetate	13177008	2
Caelo	Chlorhexidine diacetate	13177009	3
Caelo	Chlorhexidine diacetate	13177021	9
Caelo	Chlorhexidine diacetate	13177024	3
Caelo	Chlorhexidine diacetate	13177022	2
Fagron	Chlorhexidine diacetate	13E03-B06-287926	2
Caelo	Chlorhexidine diacetate	15261003	4
Caelo	Chlorhexidine diacetate	15261005	2
Caelo	Chlorhexidine diacetate	15261007	5
Caelo	Chlorhexidine diacetate	15261009	7
Caelo	Chlorhexidine diacetate	15261012	1
Caelo	Chlorhexidine diacetate	15261014	6
Caelo	Chlorhexidine diacetate	15438903	2
Sanacorp	Chlorhexidine diacetate	7/AKD6	1
Sanacorp	Chlorhexidine diacetate		1
Caelo	Chlorhexidine diacetate	9113903	1
Phönix	Chlorhexidine diacetate	9113916	2
Caelo	Chlorhexidine diacetate	10154412	1
Caelo	Chlorhexidine diacetate	10154407	1
Caelo	Chlorhexidine diacetate	10154424	1
Caelo	Chlorhexidine diacetate	10154429	1
Euro OTC	Chlorhexidine diacetate	10154430	1
Caelo	Chlorhexidine diacetate	1091139389	1
ANZAG am 15.05.2012	Chlorhexidine diacetate	11204401	2
Caelo	Chlorhexidine diacetate	11204401	3
Caelo	Chlorhexidine diacetate	11204405	1
Anzag 17.07.2012	Chlorhexidine diacetate	11204405	1
Caelo	Chlorhexidine diacetate	11204407	1
Caelo	Chlorhexidine diacetate	11204408	3
Fagron	Chlorhexidine diacetate	11L28N02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Chlorhexidine diacetate	12142702	3
Phoenix	Chlorhexidine diacetate	11204408	1
phoenix	Chlorhexidine diacetate	12142704	1
Caelo	Chlorhexidine diacetate	12142704	3
Caelo	Chlorhexidine diacetate	12142705	3
Caesar&loretz,Anzag	Chlorhexidine diacetate	12142704	1
Caelo	Chlorhexidine diacetate	12142709	1
Caelo	Chlorhexidine diacetate	12142715	2
Caelo	Chlorhexidine diacetate	12142720	10
Noweda	Chlorhexidine diacetate	12142720	1
Caesar & Loretz GmbH, 4...	Chlorhexidine diacetate	12142720	1
Sanacorp	Chlorhexidine diacetate	12142726	1
Phoenix	Chlorhexidine diacetate	12142726	1
Sanacorp	Chlorhexidine diacetate	12142734	1
Caelo	Chlorhexidine diacetate	12177503	1
Caelo	Chlorhexidine diacetate	12177505	6
Caelo	Chlorhexidine diacetate	12177504	1
Caelo	Chlorhexidine diacetate	12177502	1
Großhandel	Chlorhexidine diacetate	12177505	1
Caelo	Chlorhexidine diacetate	12177510	10
Alliance Healthcare	Chlorhexidine diacetate	12177510	1
Caelo	Chlorhexidine diacetate	123456	1
Caelo	Chlorhexidine diacetate	1242720	1
Caelo	Chlorhexidine diacetate	1602211263	1
phönix	Chlorhexidine diacetate		1
Fagron	Chlorhexidine diacetate	1-8991-1-01-01	1
Ceasar & Loretz GmbH	Chlorhexidine diacetate	80104278	1
Fiebig	Chlorhexidine diacetate	12C19-N02	1
Anzag	Chlorhexidine diacetate	12177505	1
Phönix	Chlorhexidine diacetate	Retest09113916	1
Fagron	Chlorhexidine diacetate	A-130037	1
Anzag	Chlorhexidine diacetate	70558377	1
Fagron	Chlorhexidine diacetate	12E14-N11	1
Sanacorp	Chlorhexidine diacetate	12142709	1
Caelo	Chlorhexidine diacetate	1214726	1

- 55 799 spectra from 335 *Apo-Ident* customers from a total of 20 552 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chlorhexidine diacetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorhexidine diacetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	400	0	75 478
Type B	0	160	80	81 108
Type C	0	199	3	55 799

The substance/substance group *Chlorhexidine diacetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5000 %)
Type B	100.0000 % (> 99.9853 %)	66.6667 % (> 65.4167 %)
Type C	100.0000 % (> 99.8622 %)	98.5149 % (> 97.0297 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20989	20989	0.00	30.67
21041	20989	7.38	30.64
22280	20989	6.07	30.59
22456	22456	0.00	31.25
22947	20989	4.59	30.59
23041	23041	0.00	30.57
23042	23042	0.00	30.59
23043	23043	0.00	30.71
23044	23044	0.00	30.65
23048	23048	0.00	30.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Chlorhexidine dihydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20198-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chlorhexidine dihydrochloride; Chlorhexidini dihydrochloridum; Chlorhexidinum dihydrochloricum

Special notes

When selecting the *Chlorhexidine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chlorhexidine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chlorhexidine di...	10B02-N06	20198	40	AR-12-FG-002997-01
Fagron	Chlorhexidine di...	14A09-B03	21225	40	AR-15-FG-012308-01

Validation samples

A total of 213 227 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 *Chlorhexidine dihydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Chlorhexidine dihydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chlorhexidine dihydrochloride	16C11-B02-324203	22805	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Chlorhexidine dihydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Chlorhexidine dihydrochloride	14A09B03	1
Fagron	Chlorhexidine dihydrochloride	14A09-B03-293425	1

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chlorhexidine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorhexidine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	38	2	81 308
Type C	0	2	0	55 999

The substance/substance group *Chlorhexidine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	95.0000 % (> 87.5000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20198	20198	0.00	34.63
21225	21225	0.00	35.05

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Chlorocresol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20185-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Chlorocresol; Chlorocresolum

Special notes

When selecting the *Chlorocresol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chlorocresol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Chlorocresol	09282613	20185	40	AR-12-FG-002991-01
Caelo	Chlorocresol	13275106	21512	40	20130828
Caelo	Chlorocresol	13275106	21513	40	20130828

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Chlorocresol*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 90 spectra of 4 reference samples from the substance/substance group *Chlorocresol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Chlorocresol	9282613	20185 [†]	10
Caelo	Chlorocresol	1211107	21306	40
Caelo	Chlorocresol	13275106	21512 [†]	20
Caelo	Chlorocresol	13275106	21513 [†]	20

- 81 258 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 15 spectra from 12 *Apo-Ident* customers from 9 batches from the substance/substance group *Chlorocresol*.

Supplier	Substance	Batch	Spectra
Caelo	Chlorocresol	2041513	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Chlorocresol	12111017	2
Caelo	Chlorocresol	15114103	1
Caelo	Chlorocresol	12111013	2
Caelo	Chlorocresol	13275117	1
Caelo	Chlorocresol	7061304	1
Caelo	Chlorocresol	10145239	4
Caelo	Chlorocresol	23415422	1
Noweda	Chlorocresol	12111017	1
GEHE	Chlorocresol	10145219	1

- 55 986 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chlorocresol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlorocresol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	10	81 258
Type C	0	14	1	55 986

The substance/substance group *Chlorocresol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	88.8889 % (> 85.5556 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20185	20185	0.00	35.39
21512	20185	3.90	35.87
21513	20185	8.87	31.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Chlortetracycline hydrochloride
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20845-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Chlortetracycline hydrochloride; Chlortetracyclini hydrochloridum; Chlortetracyclinum hydrochloricum

Special notes

When selecting the *Chlortetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Chlortetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Chlortetracyclin...	12K30-N07	20845	40	1405318
Fagron	Chlortetracyclin...	12K30-N07	21222	40	20121210
Euro OTC	Chlortetracyclin...	1108051-02	21241	40	20111013
Fagron	Chlortetracyclin...	14J08-B07-307742	21877	40	20141029
Euro OTC	Chlortetracyclin...	1604015	22541	40	20160510*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Chlortetracycline - hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Chlortetracycline - hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Chlortetracycline hydrochlor...	7C27-N01	20119	40
Fagron	Chlortetracycline hydrochlor...	14J08-B07-307742	21877 [†]	20
Euro OTC	Chlortetracycline hydrochlor...	1604015-01	22975	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 102 spectra from 58 *Apo-Ident* customers from 36 batches from the substance/substance group *Chlortetracycline hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Chlortetracycline hydrochlor...	12K30-N07	9
Nachprüfung 2574	Chlortetracycline hydrochlor...	1108051-01	1
Euro	Chlortetracycline hydrochlor...	1108051-02	1
Phönix	Chlortetracycline hydrochlor...	1108051-02	2
Phoenix	Chlortetracycline hydrochlor...	110805102	1
Fagron	Chlortetracycline hydrochlor...	13/11-N07	3
Fagron	Chlortetracycline hydrochlor...	13K26-N06	3
Euro OTC	Chlortetracycline hydrochlor...	1412008-02	6
Caelo	Chlortetracycline hydrochlor...	1412008-01	1
Euro OTC	Chlortetracycline hydrochlor...	1412008-01	2
Euro OTC	Chlortetracycline hydrochlor...	141200802	1
Euro OTC	Chlortetracycline hydrochlor...	1412008-03	2
Fagron	Chlortetracycline hydrochlor...	14J08-B07	4
Caelo	Chlortetracycline hydrochlor...	14J08-B07-300249	1
Fagron	Chlortetracycline hydrochlor...	14J08B07300250	1
Fagron	Chlortetracycline hydrochlor...	14J08-B07-300250	5
Fagron	Chlortetracycline hydrochlor...	14J08-B07-303352	2
Caelo	Chlortetracycline hydrochlor...	14J08-B07-303352	1
Fagron	Chlortetracycline hydrochlor...	14J08-B07-307100	4
Euro OTC	Chlortetracycline hydrochlor...	1604015-01	1
Gehe	Chlortetracycline hydrochlor...	16B10-B09	1
Fagron	Chlortetracycline hydrochlor...	16B10-B09-318088	2
Caelo	Chlortetracycline hydrochlor...	16B10-B09-318088	2
Euro OTC	Chlortetracycline hydrochlor...	4612Q-01155	1
Caelo	Chlortetracycline hydrochlor...	FC13030134	1
Fagron	Chlortetracycline hydrochlor...	FC11051038	1
Euro OTC	Chlortetracycline hydrochlor...	1108051-01	9
Caelo	Chlortetracycline hydrochlor...	1108051-01	2
Euro OTC	Chlortetracycline hydrochlor...	1108051-02	5
Euro OTC	Chlortetracycline hydrochlor...	110805102	1
Fagron	Chlortetracycline hydrochlor...	12C16-N01	3
Noweda	Chlortetracycline hydrochlor...	12c16-n01	1
Anzag: 07.09.12 ek:4.01	Chlortetracycline hydrochlor...	12C16-N01	1
Fagron	Chlortetracycline hydrochlor...	12H28-N09	7
Fagron	Chlortetracycline hydrochlor...	12H28N09	1
Krieger	Chlortetracycline hydrochlor...	12C16-No1	1
Caesar & Loretz GmbH	Chlortetracycline hydrochlor...	12C16-N01	1
Alliance Healthcare	Chlortetracycline hydrochlor...	12K30-N07	1
Fagron	Chlortetracycline hydrochlor...	12K30-N07	1
Fagron	Chlortetracycline hydrochlor...	12k30-N07	1
Fagron	Chlortetracycline hydrochlor...	13111-N07	1
Fagron	Chlortetracycline hydrochlor...	27121306	1
Fagron	Chlortetracycline hydrochlor...	FC13030134	1
Euro OTC	Chlortetracycline hydrochlor...	5113I01155	1
Euro OTC	Chlortetracycline hydrochlor...	2901009V-03	1
Noweda	Chlortetracycline hydrochlor...	11K25-N13	1
EUro/AHD	Chlortetracycline hydrochlor...	1108051-02	1
Fagron	Chlortetracycline hydrochlor...	12h28-n09	1

- 55 899 spectra from 335 *Apo-Ident* customers from a total of 20 575 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Chlortetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Chlortetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	0	81 248
Type C	0	97	5	55 899

The substance/substance group *Chlortetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	95.0980 % (> 92.1569 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20845	20845	0.00	30.30
21222	20845	6.57	32.40
21241	20845	6.10	31.04
21877	22541	6.21	29.49
22541	22541	0.00	26.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cholecalciferol dry concentrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20921-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cholecalciferol dry concentrate; Cholecalciferoli pulvis; Cholecalciferolum pulveratum

Special notes

When selecting the *Cholecalciferol dry concentrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cholecalciferol dry concentrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cholecalciferol ...	1210051-01	20921	40	1403341
Euro OTC	Cholecalciferol ...	1304016-02	21240	40	20130425
Euro OTC	Cholecalciferol ...	1502021-01	21914	40	20150309
Euro OTC	Cholecalciferol ...	1508032	21949	40	20150901*

Validation samples

A total of 213 227 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 *Cholecalciferol dry concentrate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Cholecalciferol dry concentrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cholecalciferol dry concentr...	1103005-01	20353	40
Euro OTC	Cholecalciferol dry concentr...	1502021-01	21914 [†]	20
Euro OTC	Cholecalciferol dry concentr...	1508032	21949 [†]	20
Euro OTC	Cholecalciferol dry concentr...	1602019	22504	40
Euro OTC	Cholecalciferol dry concentr...	1608002	22749	40
Euro OTC	Cholecalciferol dry concentr...	1701053	23007	40

- 81 148 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 5 batches from the substance/substance group *Cholecalciferol dry concentrate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Cholecalciferol dry concentr...	1012025-01	1
Euro OTC	Cholecalciferol dry concentr...	1210051-01	2
Euro OTC	Cholecalciferol dry concentr...	L1403012-01	1
Euro OTC	Cholecalciferol dry concentr...	1304016-01	1
Euro OTC	Cholecalciferol dry concentr...	P500238	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cholecalciferol dry concentrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cholecalciferol dry concentrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	172	28	81 140
Type C	0	5	1	55 995

The substance/substance group *Cholecalciferol dry concentrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	86.0000 % (> 84.5000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20921	20921	0.00	53.25
21240	20921	11.22	52.55
21914	21949	1.77	29.52
21949	21949	0.00	30.13

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cholesterol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20446-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cholesterol; Cholesterinum; Cholesterolum

Special notes

When selecting the *Cholesterol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cholesterol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cholesterol	10315-N07	20446	40	AR-12-FG-008402-01
Caelo	Cholesterol	11242104	20459	40	AR-13-FG-002658-01
Fagron	Cholesterol	08L09-N01	20510	40	AR-14-FG-000153-01
Fagron	Cholesterol	13F10-B40	21219	40	20131223
Caelo	Cholesterol	160444	22461	40	20160222*
Fagron	Cholesterol	15J23-B03-325106	22971	40	20151103

Validation samples

A total of 213 227 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 *Cholesterol*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Cholesterol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cholesterol	13148703	21310	40
Caelo	Cholesterol	160444	22461 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 48 spectra from 26 *Apo-Ident* customers from 33 batches from the substance/substance group *Cholesterol*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Cholesterol	12I13-N02	2
Caelo	Cholesterol	12248403	1
Fagron	Cholesterol	13C25-N12	2
Fagron	Cholesterol	13F10-B40	1
Fagron	Cholesterol	13F10-B40-289016	2
Fagron	Cholesterol	14B27-B05	1
Fagron	Cholesterol	14B27-B05-293548	2
Fagron	Cholesterol	14G04-B02-300830	1
Caelo	Cholesterol	15358801	5
Fagron	Cholesterol	15G31-B05-312377	1
Caelo	Cholesterol	15407101	2
Caelo	Cholesterol	15B09-B02-308259	1
Fagron	Cholesterol	15B09-B02-308259	1
Fagron	Cholesterol	15G31-B05-312378	1
Fagron	Cholesterol	8J28-N10	1
Fagron	Cholesterol	10H24-N06	1
Caelo	Cholesterol	11242103	1
Fagron	Cholesterol	11A17-N07	1
Fagron	Cholesterol	13G10-N11	3
Fagron	Cholesterol	2013U-01270	1
Caelo	Cholesterol	14208602	1
Caelo	Cholesterol	13148704	1
Caelo	Cholesterol	15028303	1
Caelo	Cholesterol	14122501	2
Fagron	Cholesterol	14G04-B02	1
Fagron	Cholesterol	15B09-B02	1
Fagron	Cholesterol	15G31-B05	2
Caelo	Cholesterol	15G31-B05-312376	1
Phönix, 23.05.2013	Cholesterol	12155605	1
Fagron	Cholesterol		1
Caelo	Cholesterol	12155605	1
Fagron	Cholesterol	12D02-N10	1
Caelo	Cholesterol	13056903	1
Caelo	Cholesterol	14027201	1
Fagron	Cholesterol	10B15-N07	1

- 55 953 spectra from 335 *Apo-Ident* customers from a total of 20 578 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cholesterol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cholesterol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	60	0	81 288
Type C	0	44	4	55 953

The substance/substance group *Cholesterol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	91.6667 % (> 85.4167 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20446	20446	0.00	40.47
20459	20459	0.00	44.41
20510	20510	0.00	35.61
21219	20446	7.82	48.00
22461	22461	0.00	50.47
22971	20446	6.58	31.16

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Choline chloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22639-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Choline chloride; Cholinii chloridum

Special notes

When selecting the *Choline chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Choline chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Choline chloride	162092	22639	40	20160801*
Caelo	Choline chloride	14273819	22663	40	20141002

Validation samples

A total of 213 227 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 *Choline chloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Choline chloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Choline chloride	14273819	22734	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Choline chloride*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Validation results

The validation runs checked whether the substance/substance group *Choline chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Choline chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Choline chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22639	22639	0.00	75.24
22663	22639	11.03	72.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Choline hydrogen tartrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20719-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Choline hydrogen tartrate; Cholinii hyrogenotartras; Cholinium bitartaricum

Special notes

When selecting the *Choline hydrogen tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Choline hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Choline hydrogen...	1603044	22549	40	20160429*
Euro OTC	Choline hydrogen...	1607020	22689	40	20160808*
Euro OTC	Choline hydrogen...	1603044-01	23010	40	20160429

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Choline hydrogen tartrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Choline hydrogen tartrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Choline hydrogen tartrate	WE-11030077-01	20427	40
Euro OTC	Choline hydrogen tartrate	L1208016-01	20719	40
Euro OTC	Choline hydrogen tartrate	L1208016-02	21242	40

- 81 228 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 2 *Apo-Ident* customers from 5 batches from the substance/substance group *Choline hydrogen tartrate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Choline hydrogen tartrate	1309023-01	3

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Choline hydrogen tartrate	1303021-01	2
Euro OTC	Choline hydrogen tartrate	1405017-01	1
Euro OTC	Choline hydrogen tartrate	1501024-01	3
Euro OTC	Choline hydrogen tartrate	L1208016-01	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Choline hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Choline hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	40	81 228
Type C	0	10	0	55 991

The substance/substance group *Choline hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	66.6667 % (> 64.1667 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22549	22549	0.00	51.36
22689	22689	0.00	50.90
23010	22549	2.22	51.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ciclopirox olamine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20601-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ciclopirox olamine; Aminoethanolum Cicloproxi; Ciclopirox olaminum

Special notes

When selecting the *Ciclopirox olamine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ciclopirox olamine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ciclopirox olamine	12040904	20601	40	1401161
Fagron	Ciclopirox olamine	13A16-N04	21218	40	20130117
Caelo	Ciclopirox olamine	13343209	21298	40	AR-15-FG-016214-01
Caelo	Ciclopirox olamine	14147406	21655	40	AR-15-FG-014857-01
Fagron	Ciclopirox olamine	14F13-B03-302340	21964	40	1608170
Caelo	Ciclopirox olamine	14378809	21991	40	20150227

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ciclopirox olamine	15364408	23011	40	20151201
Caelo	Ciclopirox olamine	14147406	21655SI	40	AR-15-FG-014857-01
Fagron	Ciclopirox olamine	14F13-B03-302340	21964SI	40	1608170
Caelo	Ciclopirox olamine	14378809	21991SI	40	20150227
Caelo	Ciclopirox olamine	15364408	23011SI	40	20151201

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 11 reference samples from the substance/substance group *Ciclopirox olamine*. These samples are listed above in the [calibration samples](#) section.
- 75 438 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 440 spectra of 13 reference samples from the substance/substance group *Ciclopirox olamine*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ciclopirox olamine	pending	20558	40
Fagron	Ciclopirox olamine	12B22-N03	20585	40
Caelo	Ciclopirox olamine	12040906	20648	40
Fagron	Ciclopirox olamine	14E21-M04	21594	60
Caelo	Ciclopirox olamine	14147406	21655 [†]	20
Fagron	Ciclopirox olamine	14F13-B03-302340	21964 [†]	20
Caelo	Ciclopirox olamine	14378809	21991 [†]	20
Fagron	Ciclopirox olamine	16G26-B02-324884	22969	40
Fagron	Ciclopirox olamine	14E21-M04	21594SI	60
Caelo	Ciclopirox olamine	14147406	21655SI [†]	20
Fagron	Ciclopirox olamine	14F13-B03-302340	21964SI [†]	20
Caelo	Ciclopirox olamine	14378809	21991SI [†]	20
Fagron	Ciclopirox olamine	16G26-B02-324884	22969SI	40

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 80 908 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 70 spectra from 26 *Apo-Ident* customers from 39 batches from the substance/substance group *Ciclopirox olamine*.

Supplier	Substance	Batch	Spectra
Caelo	Ciclopirox olamine	13343205	2
Caelo	Ciclopirox olamine	13343207	1
Caelo	Ciclopirox olamine	13343208	5
Caelo	Ciclopirox olamine	13343209	3
Caelo	Ciclopirox olamine	14147402	5
Caelo	Ciclopirox olamine	14147403	2
Caelo	Ciclopirox olamine	14147405	2
Caelo	Ciclopirox olamine	14275801	2
Caelo	Ciclopirox olamine	14275802	2
Caelo	Ciclopirox olamine	14378802	1
Caelo	Ciclopirox olamine	14378804	2
Caelo	Ciclopirox olamine	14378801	3
Caelo	Ciclopirox olamine	14378803	1
Caelo	Ciclopirox olamine	14378805	2
Caelo	Ciclopirox olamine	14378806	2
Caelo	Ciclopirox olamine	14378809	1
Caelo	Ciclopirox olamine	14378810	1
Caelo	Ciclopirox olamine	15018802	2
Gehe	Ciclopirox olamine	14E21-M04	1
Fagron	Ciclopirox olamine	14E21-M05	1
Caelo	Ciclopirox olamine	15364401	1
Caelo	Ciclopirox olamine	15364402	1
Caelo	Ciclopirox olamine	15364405	1
Caelo	Ciclopirox olamine	15018803	1
Caelo	Ciclopirox olamine	15364407	1
Caelo	Ciclopirox olamine	12040903	1
Fagron	Ciclopirox olamine	11h03-n02	1
Fagron	Ciclopirox olamine	11H03-N02	1
Caelo	Ciclopirox olamine	12040911	2
Fagron	Ciclopirox olamine	10L09-N03	1
Caelo	Ciclopirox olamine	12040906	1
Noweda	Ciclopirox olamine	12040911	1
Caelo	Ciclopirox olamine	12B22-N03	1
Cael	Ciclopirox olamine	12040911	2
Noweda	Ciclopirox olamine	12B22-N03	1
Noweda	Ciclopirox olamine	12D26-N10	2
Fagron	Ciclopirox olamine	12G12-N09	3
Kehr	Ciclopirox olamine	12G12-N09	1
Caelo	Ciclopirox olamine	13343201	1
Caelo	Ciclopirox olamine	13343	1
Caelo	Ciclopirox olamine	13343202	1
Phönix	Ciclopirox olamine	13A16-N04	1
Fagron	Ciclopirox olamine	13A16-N04	1
Fagron	Ciclopirox olamine	G711016	1

- 55 931 spectra from 335 *Apo-Ident* customers from a total of 20 572 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ciclopirox olamine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciclopirox olamine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	440	0	75 438
Type B	0	360	80	80 908
Type C	0	62	8	55 931

The substance/substance group *Ciclopirox olamine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9853 %)	81.8182 % (> 81.1364 %)
Type C	100.0000 % (> 99.8622 %)	88.5714 % (> 84.2857 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20601	20601	0.00	57.54
21218	21964	8.38	47.87
21298	21298	0.00	58.49
21655	21655	0.00	58.63
21964	21964	0.00	48.18
21991	21298	4.50	58.25
23011	21298	6.56	58.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ciclosporin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20941-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ciclosporin; Ciclosporinum

Special notes

When selecting the *Ciclosporin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ciclosporin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ciclosporin	13D26-N07	20941	40	1402057
Caelo	Ciclosporin	12317707	21082	40	20121119
Caelo	Ciclosporin	13148604	21474	40	1412541
Caelo	Ciclosporin	13148604	21475	40	20130613
Fagron	Ciclosporin	13D26-N07	21671	40	1508429

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Ciclosporin*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 6 reference samples from the substance/substance group *Ciclosporin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ciclosporin	10F22-N01	20232	40
Fagron	Ciclosporin	10G07-N03	20281	40
Caelo	Ciclosporin	13148604	21474 [†]	20
Caelo	Ciclosporin	13148604	21475 [†]	20
Fagron	Ciclosporin	13D26-N07	21671 [†]	20
Caelo	Ciclosporin	15278907	22966	40

- 81 168 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 98 spectra from 47 *Apo-Ident* customers from 35 batches from the substance/substance group *Ciclosporin*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Ciclosporin	13148606	6
Fagron	Ciclosporin	10J18-N06	1
Caelo	Ciclosporin	13346803	3
Caelo	Ciclosporin	13346808	1
Fagron	Ciclosporin	13414038	1
Fagron	Ciclosporin	13A28-N04	5
Fagron	Ciclosporin	13B19-N02	3
Fagron	Ciclosporin	13B19N02	2
Caelo	Ciclosporin	13D26-N07	3
Fagron	Ciclosporin	13D26-N07	7
Fagron	Ciclosporin	13H19-N09	2
Fagron	Ciclosporin	13H19N09	1
Caelo	Ciclosporin	14199104	3
Fagron	Ciclosporin	14A15-N01	2
Fagron	Ciclosporin	14G22-B02-296891	4
Caelo	Ciclosporin	15049703	3
Caelo	Ciclosporin	15278901	2
Fagron	Ciclosporin	16121401	1
Fagron	Ciclosporin	15F29B14316270	1
Fagron	Ciclosporin	15D23-B05	2
Fagron	Ciclosporin	1110532	1
Caelo	Ciclosporin	12165602	3
Fagron	Ciclosporin	1103531	2
Fagron	Ciclosporin	11K17-N13	1
Caelo	Ciclosporin	12165603	2
Caelo	Ciclosporin	123117702	1
Caelo	Ciclosporin	12317702	5
Caelo	Ciclosporin	12317707	3
Caelo	Ciclosporin	12317703	1
Caelo	Ciclosporin	12E31-N02	1
Fagron	Ciclosporin	12E31-N02	9
Phoenix am 21.01.2013	Ciclosporin	12E31-N02	2
Caelo	Ciclosporin	13031303	1
Phönix	Ciclosporin	13346803	2
Anzag 23.03.13	Ciclosporin	13A28-N04	1
Caelo	Ciclosporin	13A28-N04	4
Fagron	Ciclosporin	25051302	1
Phönix	Ciclosporin	13D26-N07	1
Caelo	Ciclosporin	14A15-No1	1
Fargon	Ciclosporin	13D26-No7	1
Caelo	Ciclosporin	19011301	1
Fagron	Ciclosporin	13d026N07	1

- 55 903 spectra from 335 *Apo-Ident* customers from a total of 20 576 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ciclosporin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciclosporin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	146	34	81 168
Type C	0	78	20	55 903

The substance/substance group *Ciclosporin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	81.1111 % (> 79.4444 %)
Type C	100.0000 % (> 99.8622 %)	79.5918 % (> 76.5306 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20941	20941	0.00	20.54
21082	21474	8.39	22.04
21474	21474	0.00	20.75
21475	21474	2.04	20.87
21671	21671	0.00	15.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cinchocaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20785-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cinchocaine hydrochloride; Cinchocaini hydrochloridum; Cinchocainum hydrochloricum

Special notes

When selecting the *Cinchocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cinchocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cinchocaine hydr...	12F25-N10	20785	40	1401148
Fagron	Cinchocaine hydr...	13G24-N05	21223	40	20130826

Validation samples

A total of 213 227 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 *Cinchocaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *Cinchocaine hydrochloride*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Cinchocaine hydrochloride*.

Supplier	Substance	Batch	Spectra
Phönix	Cinchocaine hydrochloride	13E13-N07	1
Fagron	Cinchocaine hydrochloride	12F25-N10	1

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cinchocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cinchocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	0	0	81 348
Type C	0	1	1	55 999

The substance/substance group *Cinchocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20785	20785	0.00	64.46
21223	20785	8.00	64.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cinnarizine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20681-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cinnarizine; Cinnarizinum

Special notes

When selecting the *Cinnarizine* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cinnarizine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cinnarizine	11L22-N13	20681	40	20120104
Fagron	Cinnarizine	13H01-N07	20946	40	1402306
Fagron	Cinnarizine	14D09-B01-294702	22358	40	AR-16-FG-008930-01

Validation samples

A total of 213 227 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 *Cinnarizine*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Cinnarizine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Cinnarizine	11L22-N13	20590	40
Fagron	Cinnarizine	14D09-B01-294702	22358 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 3 *Apo-Ident* customers from 6 batches from the substance/substance group *Cinnarizine*.

Supplier	Substance	Batch	Spectra
Fagron	Cinnarizine	13H01-N07	4
Fagron	Cinnarizine	8D11-N04	1
Fagron	Cinnarizine	13I26-N22	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
Fagron	Cinnarizine	14D09-B01	3
EuRho/Sanacorp	Cinnarizine	14D09-B01-294702	2
Fagron	Cinnarizine	14D09-B01-292883	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cinnarizine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cinnarizine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 758
Type B	0	60	0	81 288
Type C	0	13	0	55 988

The substance/substance group *Cinnarizine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20681	22358	9.89	59.50
20946	20946	0.00	56.36
22358	22358	0.00	54.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ciprofloxacin hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20945-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ciprofloxacin hydrochloride; Ciprofloxacin hydrochloridum

Special notes

When selecting the *Ciprofloxacin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ciprofloxacin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ciprofloxacin hy...	12B08-N03	20945	40	1401421
Fagron	Ciprofloxacin hy...	14B25-B02	21254	40	20140324

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Ciprofloxacin hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Ciprofloxacin hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ciprofloxacin hydrochloride	15D07-B01-312864	22755	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 batches from the substance/substance group *Ciprofloxacin hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Ciprofloxacin hydrochloride	13F13-N03	1
Fagron	Ciprofloxacin hydrochloride	14/15-B08-303363	1
Fagron	Ciprofloxacin hydrochloride	14B25-B02-291-783	1
Fagron	Ciprofloxacin hydrochloride	14I15-B08	1
Fagron	Ciprofloxacin hydrochloride	14I15-B08	1
Fagron	Ciprofloxacin hydrochloride	14B25-B02-291783	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ciprofloxacin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ciprofloxacin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	6	0	55 995

The substance/substance group *Ciprofloxacin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20945	20945	0.00	47.12
21254	20945	6.26	48.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Citric acid monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20012-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Citric acid monohydrate; Acidum citricum monohydricum

Special notes

When selecting the *Citric acid monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Citric acid monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Citric acid mono...	82803249	20012	30	I 2009 000 297
Fagron	Citric acid mono...	12D26-N02	20926	40	20120515
Caelo	Citric acid mono...	15185301	22340	40	20150708

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Citric acid monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Citric acid monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Citric acid monohydrate	15185301	22340 [†]	20
Caelo	Citric acid monohydrate	161865	22617	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 126 spectra from 47 *Apo-Ident* customers from 53 batches from the substance/substance group *Citric acid monohydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Citric acid monohydrate	13069105	3
Caelo	Citric acid monohydrate	13069103	2
Caelo	Citric acid monohydrate	13069133	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
Caelo	Citric acid monohydrate	13069125	2
Caelo	Citric acid monohydrate	14311807	2
Caelo	Citric acid monohydrate	15087512	1
Caelo	Citric acid monohydrate	15185304	6
Caelo	Citric acid monohydrate	15185317	1
Caelo	Citric acid monohydrate	P135/14	1
Caelo	Citric acid monohydrate	12125907	7
Caelo	Citric acid monohydrate	13069104	6
Caelo	Citric acid monohydrate	13069113	2
Caelo	Citric acid monohydrate	12125937	3
Caelo	Citric acid monohydrate	13069110	4
Caelo	Citric acid monohydrate	13069124	5
Caelo	Citric acid monohydrate	13069111	4
Caelo	Citric acid monohydrate	13069128	4
Caelo	Citric acid monohydrate	13069129	2
Caelo	Citric acid monohydrate	13069130	1
Caelo	Citric acid monohydrate	14038401	9
Caelo	Citric acid monohydrate	14038403	2
Caelo	Citric acid monohydrate	14311808	4
Caelo	Citric acid monohydrate	14311812	2
Caelo	Citric acid monohydrate	14311813	1
Caelo	Citric acid monohydrate	15087509	4
Caelo	Citric acid monohydrate	15087502	2
Caelo	Citric acid monohydrate	15087510	1
Caelo	Citric acid monohydrate	15185302	3
Caelo	Citric acid monohydrate	2515Q-02959	1
Bombastus	Citric acid monohydrate	287593	1
Krieger	Citric acid monohydrate	613001-1-P	1
Caelo	Citric acid monohydrate	15185301	1
Caelo	Citric acid monohydrate	15185309	1
Ebert 17.08.16	Citric acid monohydrate	15185314	1
Purren Apotheke	Citric acid monohydrate	10111503	2
Caelo	Citric acid monohydrate	11041413	1
VDL	Citric acid monohydrate	263669	1
Caelo	Citric acid monohydrate	11208130	3
Euro OTC	Citric acid monohydrate	11208130	2
Caelo	Citric acid monohydrate	11208132	5
Caelo	Citric acid monohydrate	11208133	1
Caelo	Citric acid monohydrate	12125904	2
Fagron	Citric acid monohydrate	11K01-N05	1
Krämer&Martin	Citric acid monohydrate	11742009053020	1
Caesar &Loretz GmbH	Citric acid monohydrate	12125937	1
Caelo	Citric acid monohydrate	12125938	1
Caelo	Citric acid monohydrate	1212937	1
Caelo	Citric acid monohydrate	1215907	1
Caelo	Citric acid monohydrate	1215911	1
Sanacorp	Citric acid monohydrate	1215937	1
Fagron	Citric acid monohydrate	12D26-N02	1
Caelo	Citric acid monohydrate	13069106	1
Caelo	Citric acid monohydrate	13069126	1
Fiebig28.08.13 EK6,60	Citric acid monohydrate	13069111	1
Caelo	Citric acid monohydrate	15087503	1
Azelis	Citric acid monohydrate	TH4120517	1

- 55 875 spectra from 335 *Apo-Ident* customers from a total of 20 559 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Citric acid monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citric acid monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	60	0	81 288
Type C	0	114	12	55 875

The substance/substance group *Citric acid monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	90.4762 % (> 88.0952 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20012	20012	0.00	54.35
20926	20012	6.15	53.85
22340	20012	5.06	54.52

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Citric acid, anhydrous**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20019-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Citric acid, anhydrous; Acidum citricum anhydricum

Special notes

When selecting the *Citric acid, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Citric acid, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Citric acid, anh...	11380204	20682	40	20120127
Caelo	Citric acid, anh...	12043112	20683	40	20120229
Fagron	Citric acid, anh...	12F18-N03	20706	40	20120628
Fagron	Citric acid, anh...	13G24-N13	20913	40	20130827
Caelo	Citric acid, anh...	13396502	21455	40	20140110
Caelo	Citric acid, anh...	13243213	21487	40	20130821
Caelo	Citric acid, anh...	160386	22463	40	20160315*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Citric acid, anhydrous*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 250 spectra of 6 reference samples from the substance/substance group *Citric acid, anhydrous*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Citric acid, anhydrous	91584259	20019	70
Caelo	Citric acid, anhydrous	13396502	21455 [†]	20
Caelo	Citric acid, anhydrous	160386	22463 [†]	20
Caelo	Citric acid, anhydrous	160387	22478	60
Caelo	Citric acid, anhydrous	162086	22620	40
Caelo	Citric acid, anhydrous	162154	22622	40

- 81 098 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 1005 spectra from 251 *Apo-Ident* customers from 318 batches from the substance/substance group *Citric acid, anhydrous*.

Supplier	Substance	Batch	Spectra
Noweda	Citric acid, anhydrous	10182420	2
Caelo	Citric acid, anhydrous	13243213	9
Caelo	Citric acid, anhydrous	13243201	12
Caelo	Citric acid, anhydrous	13243214	12
Caelo	Citric acid, anhydrous	13243216	9
Caelo	Citric acid, anhydrous	13243219	4
Caelo	Citric acid, anhydrous	13243218	4
Bombastus	Citric acid, anhydrous	13396502	1
Caelo	Citric acid, anhydrous	13396506	1
Caelo	Citric acid, anhydrous	13243229	1
Caelo	Citric acid, anhydrous	13243224	2
Caelo	Citric acid, anhydrous	13396515	4
Fagron	Citric acid, anhydrous	13K18-B34-291519	5
Fagron	Citric acid, anhydrous	13K18-B34-291522	3
Caelo	Citric acid, anhydrous	14186312	8
Fagron	Citric acid, anhydrous	14E06-B07-293890	2
Caelo	Citric acid, anhydrous	15063003	4
Caelo	Citric acid, anhydrous	15063204	4
Caelo	Citric acid, anhydrous	15063213	9
Caelo	Citric acid, anhydrous	15087903	6
Caelo	Citric acid, anhydrous	16004701	3
Caelo	Citric acid, anhydrous	16004705	3
Caelo	Citric acid, anhydrous	16038704	2
Euro OTC	Citric acid, anhydrous	L1408011-02	1
Caelo	Citric acid, anhydrous	10182420	1
Holdermann	Citric acid, anhydrous	1011047-03	1
Caelo	Citric acid, anhydrous	11380204	4
Fagron	Citric acid, anhydrous	1155609	14
Caelo	Citric acid, anhydrous	1155609	2
Gehe	Citric acid, anhydrous	11F29-N03	1
Fagron	Citric acid, anhydrous	11K07-N01	10
Caelo	Citric acid, anhydrous	12043105	2
Caelo	Citric acid, anhydrous	12043111	1
Caelo	Citric acid, anhydrous	12156824	5
Sanacorp	Citric acid, anhydrous	12156824	1
Caelo	Citric acid, anhydrous	13050617	13
Fagron	Citric acid, anhydrous	12B01-N01	23
Caelo	Citric acid, anhydrous	13050623-3376319052	1
Caelo	Citric acid, anhydrous	13A04-N04	3
Fagron	Citric acid, anhydrous	13A04N04	1
EuRho/Phönix	Citric acid, anhydrous	L1304042-01	1
Caelo	Citric acid, anhydrous	11178303	3
Caelo	Citric acid, anhydrous	11380217	2
Fagron	Citric acid, anhydrous	1156158	1
Caelo	Citric acid, anhydrous	12156832	9
Fagron	Citric acid, anhydrous	1172673	3
Fagron	Citric acid, anhydrous	11C24N022869/4250	1
Fagron	Citric acid, anhydrous	11H30-N05	2
Caelo	Citric acid, anhydrous	12175711	5
Caelo	Citric acid, anhydrous	12175716	4
Caelo	Citric acid, anhydrous	12156811	13
Caelo	Citric acid, anhydrous	12175718	1
Caelo	Citric acid, anhydrous	13031502	1
Caelo	Citric acid, anhydrous	13050622	7
Caelo	Citric acid, anhydrous	13061502	1
Caelo	Citric acid, anhydrous	13175403	18

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	13175405	8
Caelo	Citric acid, anhydrous	13175404	5
Caelo	Citric acid, anhydrous	13175406	1
Caelo	Citric acid, anhydrous	13175409	23
Caelo	Citric acid, anhydrous	13175410	3
Caelo	Citric acid, anhydrous	13175411	11
Caelo	Citric acid, anhydrous	13243005	1
Caelo	Citric acid, anhydrous	13175426	3
Caelo	Citric acid, anhydrous	13242225	1
Caesar & Loretz GmbH	Citric acid, anhydrous	13243201	1
Caelo	Citric acid, anhydrous	13243202	7
Caelo	Citric acid, anhydrous	13243208	2
Caelo	Citric acid, anhydrous	13243210	8
Gehe	Citric acid, anhydrous	13243213	1
Caesar & Loretz GmbH	Citric acid, anhydrous	13243214	1
Sanacorp	Citric acid, anhydrous	13243214	1
Caelo	Citric acid, anhydrous	13243217	5
GEHE 02.07.2014	Citric acid, anhydrous	13243217	1
Caelo	Citric acid, anhydrous	13243220	2
Caelo	Citric acid, anhydrous	13243221	7
Caelo	Citric acid, anhydrous	13243225	5
Caelo	Citric acid, anhydrous	13396502	2
AHD	Citric acid, anhydrous	13396502	1
Caelo	Citric acid, anhydrous	13396504	1
Fagron	Citric acid, anhydrous	13A04-N04	15
Phoenix 07.04.2014	Citric acid, anhydrous	13A04-N04	1
Phönix Gotha	Citric acid, anhydrous	13A04-N040049-100	1
Caelo	Citric acid, anhydrous	13D29-N02	1
Fagron	Citric acid, anhydrous	13D29N02	1
Fagron	Citric acid, anhydrous	13F12-N08	2
Fagron	Citric acid, anhydrous	13F12-N01	3
Fagron	Citric acid, anhydrous	13G04-N05	6
Fagron	Citric acid, anhydrous	13G24N13	2
Fagron	Citric acid, anhydrous	13G24-N24	10
Fagron	Citric acid, anhydrous	13G24-N240029/900	1
Fagron	Citric acid, anhydrous	13G24-N240739/900	1
Fagron	Citric acid, anhydrous	13K18-B34	6
Fagron	Citric acid, anhydrous	13H22-N09	2
Fagron	Citric acid, anhydrous	13K18-B34-288371	4
Caelo	Citric acid, anhydrous	13K18-B34	1
Caelo	Citric acid, anhydrous	13K18-B34-288371TEST	1
Fagron	Citric acid, anhydrous	13k18-B34-288372	1
Fagron	Citric acid, anhydrous	13K18-B34-288372	6
Caelo	Citric acid, anhydrous	13K18-B34-288372	1
Fagron	Citric acid, anhydrous	13K18-B34-288373	1
Fagron	Citric acid, anhydrous	13K18-B34-291071	4
Fagron	Citric acid, anhydrous	13K18-B34-291072	1
Großhandel	Citric acid, anhydrous	13K18-B34-291072	1
Fagron	Citric acid, anhydrous	13K18-B34-291520	6
Fagron	Citric acid, anhydrous	13K18B34291520	1
Caelo	Citric acid, anhydrous	13K18-B34-291520	1
Caelo	Citric acid, anhydrous	13K18-B34-291522	1
Fagron	Citric acid, anhydrous	13K18-B34-291523	1
Fagron	Citric acid, anhydrous	13K18-B34-291521	4
Fagron	Citric acid, anhydrous	13k18-b34-291522	1
Fagron	Citric acid, anhydrous	13K18-B34-293871	2
Fagron	Citric acid, anhydrous	13L05-B02-296246	2
Caelo	Citric acid, anhydrous	13K18-B34-291523	2
Fagron	Citric acid, anhydrous	13L05-B02-309050	1
Fagron	Citric acid, anhydrous	13L18-B39-289347	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	14041506	1
Caelo	Citric acid, anhydrous	14071501	1
Caelo	Citric acid, anhydrous	14186301	9
Caelo	Citric acid, anhydrous	14186302	6
Phönix	Citric acid, anhydrous	14186312	4
Caelo	Citric acid, anhydrous	14186313	3
Caelo	Citric acid, anhydrous	14186314	3
Caelo	Citric acid, anhydrous	14E06-B07	1
Fagron	Citric acid, anhydrous	14E06-B07-29389	1
Fagron	Citric acid, anhydrous	14E06-B07-293872	2
Fagron	Citric acid, anhydrous	14E06-B07-293875	2
Gehe Kassel, 22.05.2015	Citric acid, anhydrous	14E06-B07-293872	1
Fagron	Citric acid, anhydrous	14G04-B09-293874	7
Fagron	Citric acid, anhydrous	14G04B09293876	1
Caelo	Citric acid, anhydrous	15044901	3
Caelo	Citric acid, anhydrous	14G04-B09-293876	3
Caelo	Citric acid, anhydrous	15044902	3
Caelo	Citric acid, anhydrous	15044903	5
Fagron	Citric acid, anhydrous	15044902	1
Caelo	Citric acid, anhydrous	15044904	5
Caelo	Citric acid, anhydrous	15044905	4
Caelo	Citric acid, anhydrous	15063001	1
Caesar & Loretz GmbH Hi...	Citric acid, anhydrous	15063003	1
Caelo	Citric acid, anhydrous	15063006	3
Caelo	Citric acid, anhydrous	15063211	1
Caelo	Citric acid, anhydrous	15063206	10
AHD	Citric acid, anhydrous	15063218	1
Caelo	Citric acid, anhydrous	15087902	2
Caelo	Citric acid, anhydrous	15088016	2
Caelo	Citric acid, anhydrous	15087510	1
Caelo	Citric acid, anhydrous	15124301	6
Caelo	Citric acid, anhydrous	15124303	1
Caelo	Citric acid, anhydrous	16004702	6
Caelo	Citric acid, anhydrous	1604701	1
Caelo	Citric acid, anhydrous	18091409	1
Fagron	Citric acid, anhydrous	1714Q1024	1
Caelo	Citric acid, anhydrous	28051401	1
Sanacorp	Citric acid, anhydrous	41/AKD4	1
Fischar	Citric acid, anhydrous	6493071	1
Fagron	Citric acid, anhydrous	700309-0003	2
Otto Fischer / Sana	Citric acid, anhydrous	6493071	1
Phoenix 07.04.2014	Citric acid, anhydrous	700309-0003	1
Euro OTC	Citric acid, anhydrous	L1408011-01	1
EuRho	Citric acid, anhydrous	L1503027-02	2
Euro OTC	Citric acid, anhydrous	L1202001-02	1
Euro OTC	Citric acid, anhydrous	702260	1
Euro OTC	Citric acid, anhydrous	L1508013-01	2
Caelo	Citric acid, anhydrous	1015U-01024	1
Fagron	Citric acid, anhydrous	14G04-B09-293876	1
Fagron	Citric acid, anhydrous	13L05B02296247	1
Caelo	Citric acid, anhydrous	14G04B09293877	1
Caelo	Citric acid, anhydrous	1396505	1
Fagron	Citric acid, anhydrous	14G04-B09-293877	4
Fagron	Citric acid, anhydrous	14G04-B09-309707	1
Fagron	Citric acid, anhydrous	14k05-b04-302816	1
Fagron	Citric acid, anhydrous	14K05-B04-302816	2
Fagron	Citric acid, anhydrous	14K05-B04-302817	1
Jenne	Citric acid, anhydrous	15063002	1
Ebert & Jacobi 12.07...	Citric acid, anhydrous	1506214	1
Caesar & Loretz GmbH	Citric acid, anhydrous	15063003	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	15063203	1
Noweda	Citric acid, anhydrous	15063203	1
Caesar&Loretz GmbH	Citric acid, anhydrous	15063213	1
Caelo	Citric acid, anhydrous	15063214	1
Caelo	Citric acid, anhydrous	15063218	3
Caelo	Citric acid, anhydrous	15063217	1
Caesar & Loretz	Citric acid, anhydrous	15087904	2
Caelo	Citric acid, anhydrous	15088017	1
Noweda	Citric acid, anhydrous	16004701	1
Caelo	Citric acid, anhydrous	16004706	1
Caesar & Lorenz GmbH	Citric acid, anhydrous	16004706	1
Caelo	Citric acid, anhydrous	16038602	2
Caelo	Citric acid, anhydrous	16038604	5
Caelo	Citric acid, anhydrous	16038606	2
Caelo	Citric acid, anhydrous	16038608	2
Caelo	Citric acid, anhydrous	16038707	2
Caelo/AHD	Citric acid, anhydrous	16038704	1
fishar	Citric acid, anhydrous	6494061	1
Caelo	Citric acid, anhydrous		3
Caelo	Citric acid, anhydrous	2071303	1
Fagron	Citric acid, anhydrous	214U-01024	1
Caelo	Citric acid, anhydrous	1081203	1
Caelo	Citric acid, anhydrous	713I-01024	1
Caelo	Citric acid, anhydrous	9199105	1
Caelo	Citric acid, anhydrous	9158408	1
Euro OTC	Citric acid, anhydrous	1011047-01	1
Anzag	Citric acid, anhydrous	10049712	1
Caelo	Citric acid, anhydrous	10049716	1
Caelo	Citric acid, anhydrous	10109202	1
Anzag	Citric acid, anhydrous	10049713	1
Noweda	Citric acid, anhydrous	1011047-02	1
Caelo	Citric acid, anhydrous	1011047-03	1
Euro OTC	Citric acid, anhydrous	1011047-03	1
Caelo	Citric acid, anhydrous	10182419	1
Caelo	Citric acid, anhydrous	10182417	1
Caelo	Citric acid, anhydrous	11011310	1
Fagron	Citric acid, anhydrous	10G21-N05	1
Caelo	Citric acid, anhydrous	11041410	1
Caelo	Citric acid, anhydrous	11025514	1
Caelo	Citric acid, anhydrous	11066805	1
Caelo	Citric acid, anhydrous	11066806	1
Caelo	Citric acid, anhydrous	11159801	2
Caelo	Citric acid, anhydrous	11159816	1
Caelo	Citric acid, anhydrous	11126911	1
Caelo	Citric acid, anhydrous	11126904	1
Caelo	Citric acid, anhydrous	11126909	1
Caelo	Citric acid, anhydrous	11126901	1
Anzag am 04.06.2012	Citric acid, anhydrous	11126901	1
Caelo	Citric acid, anhydrous	11159817	4
Caelo	Citric acid, anhydrous	11159821	3
Caelo	Citric acid, anhydrous	11189817	1
Fagron	Citric acid, anhydrous	1137408	2
Caelo	Citric acid, anhydrous	11159824	1
Caelo	Citric acid, anhydrous	113802013	1
Caelo	Citric acid, anhydrous	11380206	1
Caelo	Citric acid, anhydrous	11380212	1
Post-Apotheke	Citric acid, anhydrous	11380207	1
Caelo	Citric acid, anhydrous	11380208	1
Caelo	Citric acid, anhydrous	11380215	4
Caelo	Citric acid, anhydrous	11380213	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Citric acid, anhydrous	1141664	1
Fagron	Citric acid, anhydrous	1151608	3
Noweda	Citric acid, anhydrous	1141364	1
Gehe 04.04.2013	Citric acid, anhydrous	1155609	1
Jungbunzlauer Ladenburg...	Citric acid, anhydrous	1155609	1
Caelo	Citric acid, anhydrous	1172673	1
Jungbunzlauer Ladenburg...	Citric acid, anhydrous	1156158	1
Fagron	Citric acid, anhydrous	11B11-N16	1
Fagron	Citric acid, anhydrous	11C24-N02	3
Caelo	Citric acid, anhydrous	11C24-N02	1
Gehe	Citric acid, anhydrous	11C24-N03	2
GEHE	Citric acid, anhydrous	11B11-N16	1
Gehe	Citric acid, anhydrous	11C24-N02	1
Fagron	Citric acid, anhydrous	11C24-N03	6
Phönix,06.11.2012	Citric acid, anhydrous	11C24-N03	2
Fagron	Citric acid, anhydrous	11C24-N02	1
Fagron	Citric acid, anhydrous	11F29-N03	1
Noweda	Citric acid, anhydrous	11F29-N03	1
Caelo	Citric acid, anhydrous	11C24-N03	1
Phönix Gotha	Citric acid, anhydrous	11K07-N01	1
Gehe	Citric acid, anhydrous	11K07-N01	2
Caelo	Citric acid, anhydrous	11K07-N01	1
Fagron	Citric acid, anhydrous	11K07N01	1
Anzag, 19.12.2012	Citric acid, anhydrous	11K07-N01	1
Fagron	Citric acid, anhydrous	11K11-N02	2
Caelo	Citric acid, anhydrous	11K11-N02	1
Caelo	Citric acid, anhydrous	12043101	1
Noweda	Citric acid, anhydrous	12043105	1
ANZAG am 12.06.2012	Citric acid, anhydrous	12043104	1
Caelo	Citric acid, anhydrous	12043109	1
Noweda	Citric acid, anhydrous	12043110	2
Caelo	Citric acid, anhydrous	12043110	3
Gehe	Citric acid, anhydrous	12043111	1
Kehr	Citric acid, anhydrous	12043112	1
Caelo	Citric acid, anhydrous	12043112	6
Caelo	Citric acid, anhydrous	12043113	8
Caelo	Citric acid, anhydrous	12043114	2
Caelo	Citric acid, anhydrous	12043118	5
Caelo	Citric acid, anhydrous	12043120	5
Caelo	Citric acid, anhydrous	12043123	9
Alliance Healthcare	Citric acid, anhydrous	12043123	1
Caelo	Citric acid, anhydrous	12043124	3
Caelo	Citric acid, anhydrous	12156801	1
Caelo	Citric acid, anhydrous	12156803	8
Caelo	Citric acid, anhydrous	12156804	4
Caelo	Citric acid, anhydrous	12156812	4
Finze	Citric acid, anhydrous	12156812	2
Caesar & Loretz/ Noweda	Citric acid, anhydrous	12156812	1
Caelo	Citric acid, anhydrous	12156822	1
Caelo	Citric acid, anhydrous	12156823	5
Sanacorp	Citric acid, anhydrous	12156823	1
Caelo	Citric acid, anhydrous	12156830	1
Sanacorp	Citric acid, anhydrous	12156832	1
Sanacorp	Citric acid, anhydrous	1216832	1
Caelo	Citric acid, anhydrous	12175708	2
Caelo	Citric acid, anhydrous	121568704	1
Caelo	Citric acid, anhydrous	12175709	1
Fagron	Citric acid, anhydrous	12A20-N03	1
Fagron	Citric acid, anhydrous	12801-N01	1
Krömpke	Citric acid, anhydrous	12B01-N01	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fargon	Citric acid, anhydrous	12B01-N01	1
Phoenix 13.02.13	Citric acid, anhydrous	12B01-N01	2
Großhandel	Citric acid, anhydrous	12B01-N01	2
Phoenix	Citric acid, anhydrous	12b01-N01	1
Phönix Gotha	Citric acid, anhydrous	12B01-N012028/6000	1
Phönix Gotha	Citric acid, anhydrous	12B01-N011973/6000	1
Gehe	Citric acid, anhydrous		1
Fargon	Citric acid, anhydrous	12B01-NN01	1
Fagron	Citric acid, anhydrous	12B01-N01	1
Fagron	Citric acid, anhydrous	12B01-No1	1
Fagron	Citric acid, anhydrous	12B01-N01	1
Caelo	Citric acid, anhydrous	13050601	8
Fagron	Citric acid, anhydrous	12F06-M06	3
Caelo	Citric acid, anhydrous	12F06-M06	1
Noweda	Citric acid, anhydrous	13050601	1
Caesar & Loretz GmbH Hi...	Citric acid, anhydrous	13050601	2
Caelo	Citric acid, anhydrous	13050604	12
A.H. 08.06.13 ek: 6,92EUR	Citric acid, anhydrous	13050604	1
Sanacorp	Citric acid, anhydrous	13050604	2
Caelo	Citric acid, anhydrous	13050607	10
Caelo	Citric acid, anhydrous	13050606	2
AHD	Citric acid, anhydrous	13050607	1
Phönix Gotha	Citric acid, anhydrous	13050609	1
Caelo	Citric acid, anhydrous	13050610	4
Caelo	Citric acid, anhydrous	13050611	4
Caelo	Citric acid, anhydrous	13050613	15
10; 26.06.2013	Citric acid, anhydrous	13050611	1
Caelo	Citric acid, anhydrous	13050614	8
Phoenix	Citric acid, anhydrous	13050614	1
20; 10.07.2013	Citric acid, anhydrous	13050617	1
Caelo	Citric acid, anhydrous	13050618	3
Noweda	Citric acid, anhydrous	13050621	1
Caelo	Citric acid, anhydrous	13050621	2
Caelo	Citric acid, anhydrous	13050623	2
Caelo	Citric acid, anhydrous	1305601	1
Caelo	Citric acid, anhydrous	13157404	1
Caelo	Citric acid, anhydrous	13050624	1
Caelo	Citric acid, anhydrous	13175402	3
Gehe	Citric acid, anhydrous	13175404	1
Caelo	Citric acid, anhydrous	13175414	2
Caesar&lorenz,Phoenix	Citric acid, anhydrous	13243201	1
Phoenix	Citric acid, anhydrous	13243202	1
Hustadt Apotheke	Citric acid, anhydrous	1350601	1
Caelo	Citric acid, anhydrous	13804-N01	1
Fagron	Citric acid, anhydrous	13804-N02	1
Fagron	Citric acid, anhydrous	13A-04-N04	2
Phönix	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13Ao4-No4	1
Fagron	Citric acid, anhydrous	13B04-N01	1
Caelo	Citric acid, anhydrous	13G24-N13	4
Fagron	Citric acid, anhydrous	13G24-N13	4
Phoenix	Citric acid, anhydrous	13K18-B34-288372	1
Sanacorp	Citric acid, anhydrous	13K18-B34-291072	1
Fagron	Citric acid, anhydrous	14K05-B04-302815	1
Fagron	Citric acid, anhydrous	1913A-01024	1
Caelo	Citric acid, anhydrous	17071301	1
Caelo	Citric acid, anhydrous	19041305	1
Fagron	Citric acid, anhydrous	1601311024	1
Fargon/Sanacorp	Citric acid, anhydrous		1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Citric acid, anhydrous	19041304	1
Caelo	Citric acid, anhydrous	20060912-3	1
Fagron	Citric acid, anhydrous	20071203	1
Caelo	Citric acid, anhydrous	20151112-1	1
Otto Fischer GmbH	Citric acid, anhydrous	6492061	1
ALLIANCE HEALTHCARE/FIS...	Citric acid, anhydrous	6492061	1
Fagron	Citric acid, anhydrous	4810E-01024	1
GEHE	Citric acid, anhydrous	700309-0003	1
Fagron	Citric acid, anhydrous	700309-001	1
Fagron	Citric acid, anhydrous	700309-0006	1
Caelo	Citric acid, anhydrous	A-040513-1	1
Caelo	Citric acid, anhydrous	CH12043112	1
Eu Rho	Citric acid, anhydrous	L1202001-01	1
Euro OTC	Citric acid, anhydrous	L1202001-01	5
Noweda	Citric acid, anhydrous	L1202001-02	1
Euro OTC	Citric acid, anhydrous		1
Euro OTC	Citric acid, anhydrous	L130404201	2
Caelo	Citric acid, anhydrous	L130404202	1
Euro OTC	Citric acid, anhydrous	L1304042-02	1
Fagron	Citric acid, anhydrous	probe	1
Phoenix	Citric acid, anhydrous	1172673	1
Fagron	Citric acid, anhydrous	11K11-N020444/1975	1
Caelo	Citric acid, anhydrous	13243222	1
Caelo	Citric acid, anhydrous	133243218	1
Alliance Health 03.06.2...	Citric acid, anhydrous	13K18-B34	1
Fagron	Citric acid, anhydrous	13K18-B34291522	1
Euro OTC	Citric acid, anhydrous	1406014-02	1
Caelo	Citric acid, anhydrous	15063205	1
Caelo	Citric acid, anhydrous	1512402	1
Caelo	Citric acid, anhydrous	15091401	1
Caelo	Citric acid, anhydrous	24021502	1
Sanacorp	Citric acid, anhydrous	40/AKD2	1
Caelo	Citric acid, anhydrous	11380205	1
Caelo	Citric acid, anhydrous	261BE-01024	1
Fagron	Citric acid, anhydrous	10G21-N05	2
Caelo	Citric acid, anhydrous	11178304	1
Phönix	Citric acid, anhydrous	1155609	1
GEHE	Citric acid, anhydrous	11C24-N03	1
Caelo	Citric acid, anhydrous	12B01-N01	1
Caelo	Citric acid, anhydrous	12043119	1
Caelo	Citric acid, anhydrous	12156818	1
Caelo	Citric acid, anhydrous	12156827	1
Phönix Gotha	Citric acid, anhydrous	12B01-N012125/6000	1
Caelo	Citric acid, anhydrous	12B01No1	1
Euro OTC	Citric acid, anhydrous	13050604	1
Phönix Gotha	Citric acid, anhydrous	13050618	1
Euro OTC	Citric acid, anhydrous	13175410	1
fargon	Citric acid, anhydrous	13A04-N04	1
Fagron	Citric acid, anhydrous	13A04-N040019/4900	1
Fagron	Citric acid, anhydrous	22031401	1
Caelo	Citric acid, anhydrous	26111301	1
Caelo	Citric acid, anhydrous	27091304	1
Caelo	Citric acid, anhydrous	27091303	1
Fagron	Citric acid, anhydrous	28021404	1
Caelo	Citric acid, anhydrous	28021405	1

- 54 996 spectra from 335 *Apo-Ident* customers from a total of 20 296 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Citric acid, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citric acid, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	232	18	81 098
Type C	0	996	9	54 996

The substance/substance group *Citric acid, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	92.8000 % (> 91.6000 %)
Type C	100.0000 % (> 99.8622 %)	99.1045 % (> 98.8060 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20682	22463	10.13	38.86
20683	22463	4.01	34.44
20706	22463	10.37	38.69
20913	22463	5.87	35.25
21455	22463	10.47	39.38
21487	22463	4.32	32.32
22463	22463	0.00	34.57

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Citrulline**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21095-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Citrulline; Citrullinum; L-citrulline

Special notes

When selecting the *Citrulline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Citrulline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Citrulline	1310015-01	21095	40	20131120
Euro OTC	Citrulline	1403021-01	21565	40	1411031
Euro OTC	Citrulline	1506014	21828	40	20150624*
Euro OTC	Citrulline	1604038	22560	40	20160523*

Validation samples

A total of 213 227 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 *Citrulline*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 79 spectra of 3 reference samples from the substance/substance group *Citrulline*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Citrulline	1403021-01	21565 [†]	19
Euro OTC	Citrulline	1506014	21828 [†]	20
Euro OTC	Citrulline	1609013	22866	40

- 81 269 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Citrulline*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Citrulline	L1506014-01	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Citrulline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Citrulline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	79	0	81 269
Type C	0	1	0	56 000

The substance/substance group *Citrulline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.4051 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21095	21565	9.66	46.80
21565	21565	0.00	47.71
21828	21828	0.00	45.10
22560	22560	0.00	44.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clindamycin hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20214-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clindamycin hydrochloride; Clindamycini hydrochloridum; Clindamycinum hydrochloricum

Special notes

When selecting the *Clindamycin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clindamycin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Clindamycin hydr...	2908019-01	20214	40	AR-12-FG-002697-01
Euro OTC	Clindamycin hydr...	1111058-01	20757	80	20120516
Fagron	Clindamycin hydr...	13G24-N09	21224	40	1412075
Euro OTC	Clindamycin hydr...	1511004	21996	40	20151123*
Euro OTC	Clindamycin hydr...	1510038	22224	40	20151120*
Caelo	Clindamycin hydr...	15392809	22958	40	20151204

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 6 reference samples from the substance/substance group *Clindamycin hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Clindamycin hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Clindamycin hydrochloride	1401041-01	21239	40
Euro OTC	Clindamycin hydrochloride	1511004	21996 [†]	20
Euro OTC	Clindamycin hydrochloride	1510038	22224 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 106 spectra from 52 *Apo-Ident* customers from 52 batches from the substance/substance group *Clindamycin hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Clindamycin hydrochloride	1111058-03	2
Euro OTC	Clindamycin hydrochloride	813M-03534	1
Euro OTC	Clindamycin hydrochloride	1111058-01	7
Phönix	Clindamycin hydrochloride	12H30-N04	1
Fagron	Clindamycin hydrochloride	13G24N09	1
Fagron	Clindamycin hydrochloride	13G24-N09	9
Euro OTC	Clindamycin hydrochloride	130709X8	1
Caelo	Clindamycin hydrochloride	13G24-N09	1
Fagron	Clindamycin hydrochloride	13J03-B02	1
Fagron	Clindamycin hydrochloride	13J03-B02-288653	1
Fagron	Clindamycin hydrochloride	13J03-B02288654	1
Fagron	Clindamycin hydrochloride	13j03-B02-288653	1
Fagron	Clindamycin hydrochloride	13J03B02288654	1
Fagron	Clindamycin hydrochloride	13J03-B02-288654	4
Euro OTC	Clindamycin hydrochloride	1401041-01	6
Fagron	Clindamycin hydrochloride	13J03-B02-288655	1
Caelo	Clindamycin hydrochloride	1401041-01	2
Euro OTC	Clindamycin hydrochloride	140104102	1
Euro OTC	Clindamycin hydrochloride	140104101	1
EuRho	Clindamycin hydrochloride	1401041-02	1
Fagron	Clindamycin hydrochloride	14K04-B05-304995	1
Caelo	Clindamycin hydrochloride	14K04B05309851	1
Euro OTC	Clindamycin hydrochloride	1510038-01	4
Euro/Gehe16.03.16	Clindamycin hydrochloride	1510038-01	1
Euro OTC	Clindamycin hydrochloride	1511004-01	3
Eurho/Noweda	Clindamycin hydrochloride	1510038-01	1
Caelo	Clindamycin hydrochloride	151003801	1
Phönix	Clindamycin hydrochloride	15392803	1
Fagron	Clindamycin hydrochloride	15E06-B12-311886	2
Fagron	Clindamycin hydrochloride	15L22-B03-318787	1
Fagron	Clindamycin hydrochloride	15E06-B12-313089	1
Fagron	Clindamycin hydrochloride	16D05-B08-320327	1
Cealo/AHD	Clindamycin hydrochloride	16D05-B08-325088	1
Fagron	Clindamycin hydrochloride	2714Q-03534	1
Euro OTC	Clindamycin hydrochloride	25071401	1
Fagron	Clindamycin hydrochloride	P003WS13091401	1
Euro OTC	Clindamycin hydrochloride	700168	1
Euro OTC	Clindamycin hydrochloride	2908019V-03	4
Euro OTC	Clindamycin hydrochloride	T03-05/1401041-01	1
Großhandel	Clindamycin hydrochloride	1111058-01	1
Europharm/Otto	Clindamycin hydrochloride	1111058-01	1
Cealo	Clindamycin hydrochloride	1111058-01	1
Fagron	Clindamycin hydrochloride	13A22-N01	6
Euro OTC	Clindamycin hydrochloride	1111058-02	3
Fargon	Clindamycin hydrochloride	11L20-No5	1
Caelo	Clindamycin hydrochloride	1111058-03	1
Phoenix 19.08.2010	Clindamycin hydrochloride	2908019-01phoen	1
Noweda	Clindamycin hydrochloride	2908019V-03	1
Gehe	Clindamycin hydrochloride	11E12-N02	1
Gehe	Clindamycin hydrochloride	11K04-N12	1
Euro OTC	Clindamycin hydrochloride	111158-01	1
Fagron	Clindamycin hydrochloride	12F19-N07	3
Fagron	Clindamycin hydrochloride	12C19-N06	1
Fagron	Clindamycin hydrochloride	12H30-N04	1
AHD	Clindamycin hydrochloride	130402X5	1
Gehe	Clindamycin hydrochloride	13a22-n01	1
Fagron	Clindamycin hydrochloride	13C15-N06	1
Fragon	Clindamycin hydrochloride	13G24-N09	1
Gehe	Clindamycin hydrochloride	13A22-N01	1
Gehe	Clindamycin hydrochloride	700168-0002	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clindamycin hydrochloride	7BS64T1J0023	1
Fagron	Clindamycin hydrochloride	P003-WS10100301	1
Caelo	Clindamycin hydrochloride	P-003-WS10100301	1
Fagron	Clindamycin hydrochloride	12C19N06	1

- 55 895 spectra from 335 *Apo-Ident* customers from a total of 20 560 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clindamycin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clindamycin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	80	0	81 268
Type C	0	97	9	55 895

The substance/substance group *Clindamycin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	91.5094 % (> 88.6792 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20214	20214	0.00	19.29
20757	21996	3.23	28.16
21224	21224	0.00	24.11
21996	21996	0.00	26.02
22224	22224	0.00	26.39
22958	21996	2.52	25.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clindamycin-2-dihydrogen phosphate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21063-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clindamycin-2-dihydrogen phosphate; Clindamycini phosphas; Clindamycinum phosphoricum

Special notes

When selecting the *Clindamycin-2-dihydrogen phosphate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clindamycin-2-dihydrogen phosphate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clindamycin-2-di...	13166605	21063	40	1403485
Caelo	Clindamycin-2-di...	13166605	21116	40	20130624
Caelo	Clindamycin-2-di...	14257305	21798	40	AR-15-FG-015412-01
Caelo	Clindamycin-2-di...	15435801	22312	40	AR-16-FG-009129-01
Caelo	Clindamycin-2-di...	163265	23055	40	2061214*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Clindamycin-2-dihydrogen phosphate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 5 reference samples from the substance/substance group *Clindamycin-2-dihydrogen phosphate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clindamycin-2-dihydrogen pho...	14257305	21798 [†]	20
Caelo	Clindamycin-2-dihydrogen pho...	15435801	22312 [†]	20
Caelo	Clindamycin-2-dihydrogen pho...	14257305	21798SI	60
Caelo	Clindamycin-2-dihydrogen pho...	15435801	22312SI	60
Caelo	Clindamycin-2-dihydrogen pho...	163265	23055SI	40

- 81 148 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Clindamycin-2-dihydrogen phosphate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Clindamycin-2-dihydrogen pho...	14257305	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clindamycin-2-dihydrogen phosphate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clindamycin-2-dihydrogen phosphate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	68	132	81 148
Type C	0	1	0	56 000

The substance/substance group *Clindamycin-2-dihydrogen phosphate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	34.0000 % (> 32.5000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21063	21063	0.00	14.71
21116	21063	5.27	14.03
21798	21798	0.00	18.44
22312	22312	0.00	38.28
23055	23055	0.00	26.30

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clioquinol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20095-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clioquinol; Clioquinolum; Jodochloroxychinolinum

Special notes

When selecting the *Clioquinol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clioquinol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clioquinol	11304120	20895	40	20111208
Fagron	Clioquinol	13I26-N15	21236	40	20131028
Euro OTC	Clioquinol	1309009-02	21246	40	AR-15-FG-009542-01
Fagron	Clioquinol	14I11-B03-300049	21913	40	20140926
Euro OTC	Clioquinol	1509038	21944	40	20151009*
Fagron	Clioquinol	14I11-B03-300049	21972	40	20140926
Caelo	Clioquinol	163072	23047	40	20161202*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Clioquinol*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 6 reference samples from the substance/substance group *Clioquinol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clioquinol	13114413	21308	40
Fagron	Clioquinol	14I11-B03-300049	21913 [†]	20
Euro OTC	Clioquinol	1509038	21944 [†]	20
Fagron	Clioquinol	14I11-B03-300049	21972 [†]	20
Caelo	Clioquinol	16307206	22960	40
Euro OTC	Clioquinol	1612020	22985	40

- 81 168 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 424 spectra from 181 *Apo-Ident* customers from 122 batches from the substance/substance group *Clioquinol*.

Supplier	Substance	Batch	Spectra
Fagron	Clioquinol	7D20-N03	1
Caelo	Clioquinol	5031302	1
Fagron	Clioquinol	1005090024	1
Caelo	Clioquinol	3041409	1
Caelo	Clioquinol	10341601	4
Noweda	Clioquinol	10057206	1
Caelo	Clioquinol	10341605	4
Phönix	Clioquinol	1102022-02	4
Caelo	Clioquinol	10341608	2
Euro OTC	Clioquinol	1102022-01	2
Euro OTC	Clioquinol	1102022-02	3
Gehe	Clioquinol	1102022-01	1
Caelo	Clioquinol	1130312	1
Caelo	Clioquinol	11304102	9
Erika Apotheke	Clioquinol	11304102	1
Caelo	Clioquinol	11304103	2
Caelo	Clioquinol	11304105	5
Caelo	Clioquinol	11304107	6
Noweda	Clioquinol	11304107	1
Caelo	Clioquinol	11304109	2
Caelo	Clioquinol	11304111	3
Caelo	Clioquinol	11304112	6
Noweda	Clioquinol	11304111	1
Noweda	Clioquinol	11304112	1
Fagron	Clioquinol	11304112	1
Caelo	Clioquinol	11304113	4
Caelo	Clioquinol	11304116	4
Caelo	Clioquinol	11304117	11
Caelo	Clioquinol	11304119	3
Caelo	Clioquinol	11304120	13
Klenk	Clioquinol	11304120	1
Phoenix	Clioquinol	11304119	1
Alliance Health 21.10.2...	Clioquinol	11304120	1
Fagron	Clioquinol	11304120	1
Caelo	Clioquinol	11304124	11
Phönix Gotha	Clioquinol	11304124	1
Sanacorp	Clioquinol	11304124	1
Fagron	Clioquinol	11G20-N09	3
Caelo	Clioquinol	11B11-N19	1
Großhandel	Clioquinol	11G20-N09	1
Fagron	Clioquinol	11K21-N18	4
Fagron	Clioquinol	11K21N18	1
Euro OTC	Clioquinol	1201034-01	7
Caelo	Clioquinol	1201034-01	1
Noweda	Clioquinol	120103401	1
Anzag am 27.12.12	Clioquinol	1201034-01	1
Euro OTC	Clioquinol	1201034-02	8
Phönix	Clioquinol	1201034-02	1
Noweda	Clioquinol	1201034-02	2
Gehe 09.04.2013	Clioquinol	1201034-02	2
Caelo	Clioquinol	1201034-02	1
Fagron	Clioquinol	1205110014	1
Euro OTC	Clioquinol	121034-02	1
Euro OTC	Clioquinol	1213A-02562	1
Fagron	Clioquinol	12F20-N05	4
Caelo	Clioquinol	1214I02562	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clioquinol	12D02-N11	1
Caelo	Clioquinol	12F20-N05	1
Fagron	Clioquinol	12L04-N08	7
Anzag	Clioquinol	12L04-N08	1
Caelo	Clioquinol	12L04-N08	2
Fargron	Clioquinol	12L04-N08	1
Großhandel	Clioquinol	12L04-N08	1
Fagron	Clioquinol	13/26-N15	2
Euro OTC	Clioquinol	1301014-01	3
Euro OTC	Clioquinol	13010104-03	1
Euro OTC	Clioquinol	1301014-02	4
Euro OTC	Clioquinol	1309009-01	6
Axyntis Group	Clioquinol	1301014-03	1
Euro OTC	Clioquinol	1301014-02	1
Axyntis Group	Clioquinol	1301014-02	1
Euro OTC	Clioquinol	1303009-02	1
Cealo/Sanacorp	Clioquinol	1309009-01	1
Noweda	Clioquinol	1309009-01	1
Fagron	Clioquinol	1309009-01	1
Euro OTC	Clioquinol	1309009-02	8
EuRho	Clioquinol	1309009-02	1
Caelo	Clioquinol	1309009-02	1
Euro OTC	Clioquinol	130900902	1
Phönix	Clioquinol	1309009-02	1
Caelo	Clioquinol	13114404	3
Caelo	Clioquinol	13114406	1
Caelo	Clioquinol	13114408	4
Phoenix	Clioquinol	13114408	2
Caelo	Clioquinol	13114410	2
Caelo	Clioquinol	13114413	8
Caelo	Clioquinol	13114415	3
Synthexim/Phoenix	Clioquinol	13114415	1
Caelo	Clioquinol	13114417	7
Fagron	Clioquinol	13114417	1
Phoenix	Clioquinol	13114417	1
Phönix	Clioquinol	13114417	1
Caelo	Clioquinol	13114418	6
GEHE 04.08.2014	Clioquinol	13114418	1
Noweda 30.09.2014	Clioquinol	13114422	1
Caelo	Clioquinol	13114422	6
Sanacorp	Clioquinol	13114422	1
Caelo	Clioquinol	13114423	9
Fagron	Clioquinol	13114424	1
Caelo	Clioquinol	13114424	6
Fagron	Clioquinol	13A29-N07	5
Caelo	Clioquinol	13114427	3
Caelo	Clioquinol	13A29-N07	1
Fagron	Clioquinol	1326-N15	1
Fagron	Clioquinol	13D15-N01	6
Großhandel	Clioquinol	13D15-N01	2
Fagron	Clioquinol	13DS15-N01	1
Caelo	Clioquinol	13F12-N20	1
Großhandel	Clioquinol	13F12-N20	1
Fagron	Clioquinol	13F12-N20	2
Fagron	Clioquinol	13F12-N200463480	1
Fagron	Clioquinol	13I26-N15	5
Caelo	Clioquinol	13I26-N15	1
Fagron	Clioquinol	13I26N15	1
Fagron	Clioquinol		1
Fagron	Clioquinol	14/11-B03-300049	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Clioquinol	1405080031	1
Unisan	Clioquinol	14/11-B03	1
Euro OTC	Clioquinol	1409031-01	5
Euro OTC	Clioquinol	140903101	1
Euro OTC	Clioquinol	1409031-02	4
Fagron	Clioquinol	1411-B03-300049	1
Caelo	Clioquinol	14353120	1
Caelo	Clioquinol	14359102	6
Caelo	Clioquinol	14359103	9
Noweda	Clioquinol	14359103	1
Caelo	Clioquinol	14359107	1
Caelo	Clioquinol	14359111	9
caesar&lorenz,Phönix	Clioquinol	14359111	1
Caelo	Clioquinol	14359112	8
Caelo	Clioquinol	14359113	1
Caelo	Clioquinol	14359117	3
Fagron	Clioquinol	14C21806293104	1
Caelo	Clioquinol	14359119	2
Caelo	Clioquinol	14359120	4
Phönix	Clioquinol	14C21-B06	1
Noweda	Clioquinol	14359120	1
Fagron	Clioquinol	14C21-B06	1
Fagron	Clioquinol	14c21B06293104	1
Fagron	Clioquinol	14C21-B06-293104	2
Fagron	Clioquinol	14-C21-B06-293132	1
Fagron	Clioquinol	14C21-B06-293132	1
Fagron	Clioquinol	14C21-B06-297159	2
Caelo	Clioquinol	14C21-B06-293104	1
Fagron	Clioquinol	14C21-B08	1
Phönix	Clioquinol	14C21-B08	1
Euro OTC	Clioquinol	1509038	1
Euro OTC	Clioquinol	1509038-01	8
Fagron	Clioquinol	14111-B03-3000049	1
Euro OTC	Clioquinol	150903801	1
Caelo	Clioquinol	1509038-01	1
Euro OTC	Clioquinol	1509038-02	6
Euro OTC	Clioquinol	150903802	1
EURO / Sanacorp	Clioquinol	150903802	1
Euro OTC	Clioquinol	1509038-03	2
Caelo	Clioquinol	16021505	1
Fagron	Clioquinol	15L30-B05-319616	1
Euro OTC	Clioquinol	2507212562	1
Fagron	Clioquinol	2014Q2562	1
Fagron	Clioquinol	2514U2562	1
Fagron	Clioquinol	28031401	1
Caelo	Clioquinol	2814M-02562	1
Nachprüfung	Clioquinol	3021U-02562	1
Caelo	Clioquinol	4613E2562	1
Caelo	Clioquinol	3513I-02562	1
Caelo	Clioquinol	3713A2562	1
Caelo	Clioquinol		1
Caelo	Clioquinol	5213A2562	1
Sanacorp	Clioquinol	8/AKD4	1
Euro OTC	Clioquinol		1
Euro OTC	Clioquinol	1305070109	1
Caelo	Clioquinol	10341510	1
Caelo	Clioquinol	130900903	1
Sanacorp	Clioquinol	1201034-01	1
Chiesi/Gehe	Clioquinol	13114421	1
Caelo	Clioquinol	130114-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clioquinol	13A29-N07-3398310111	1

- 55 577 spectra from 335 *Apo-Ident* customers from a total of 20 491 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clioquinol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clioquinol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	180	0	81 168
Type C	0	343	81	55 577

The substance/substance group *Clioquinol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8622 %)	80.8962 % (> 80.1887 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20895	23047	6.29	84.94
21236	21246	2.78	67.34
21246	21246	0.00	69.67

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21913	21944	3.61	77.95
21944	21944	0.00	69.92
21972	21944	4.13	82.23
23047	23047	0.00	82.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clobetasol propionate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20030-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clobetasol propionate; Clobetasoli propionas; Clobetasolum propionicum

Special notes

When selecting the *Clobetasol propionate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clobetasol propionate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clobetasol propi...	13134705	21092	80	AR-15-FG-005328-01
Caelo	Clobetasol propi...	13269505	21473	40	AR-15-FG-000622-02
Euro OTC	Clobetasol propi...	1211021-04	21611	40	1605044
Caelo	Clobetasol propi...	14338001	21802	40	AR-16-FG-008581-01
Caelo	Clobetasol propi...	14338001	21896	40	1607072
Euro OTC	Clobetasol propi...	1606022	22714	40	20160713*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clobetasol propi...	15439504	22724	40	20160204
Caelo	Clobetasol propi...	14338001	21802SI	39	AR-16-FG-008581-01
Caelo	Clobetasol propi...	14338001	21896SI	30	1607072
Euro OTC	Clobetasol propi...	1606022	22714SI	40	20160713*
Caelo	Clobetasol propi...	15439504	22724SI	37	20160204

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 466 spectra of 11 reference samples from the substance/substance group *Clobetasol propionate*. These samples are listed above in the [calibration samples](#) section.
- 75 412 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 396 spectra of 11 reference samples from the substance/substance group *Clobetasol propionate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clobetasol propionate	82805079	20030	100
Euro OTC	Clobetasol propionate	pending	21013	54
zu erfassen	Clobetasol propionate	pending	21017	20
Caelo	Clobetasol propionate	13269505	21473 [†]	20
Euro OTC	Clobetasol propionate	1211021-04	21611 [†]	20
Caelo	Clobetasol propionate	14338001	21802 [†]	20
Caelo	Clobetasol propionate	14338001	21896 [†]	19
Caelo	Clobetasol propionate	161067	22470	60
Caelo	Clobetasol propionate	14338001	21802SI [†]	20
Caelo	Clobetasol propionate	14338001	21896SI [†]	15
Caelo	Clobetasol propionate	161067	22470SI	48

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 80952 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 731 spectra from 231 *Apo-Ident* customers from 186 batches from the substance/substance group *Clobetasol propionate*.

Supplier	Substance	Batch	Spectra
Gehe	Clobetasol propionate	12342310	2
Euro OTC	Clobetasol propionate	4091512	1
Caelo	Clobetasol propionate	11300707	4
Fagron	Clobetasol propionate	11129-N07	1
Euro OTC	Clobetasol propionate	1211021/02	1
Euro OTC	Clobetasol propionate	1211021-02	30
GEHE 21.03.2014	Clobetasol propionate	1211021-02	1
Symbiotica Spec./Phönix	Clobetasol propionate	1108044-04	1
Phönix Gotha	Clobetasol propionate	1211021-02	3
Fagron	Clobetasol propionate	1211021-03	2
Phoenix 02.04.2014	Clobetasol propionate	1211021-03	3
Apomix/Phönix	Clobetasol propionate	1211021-03	1
Euro OTC	Clobetasol propionate	1211021-03	22
Euro OTC	Clobetasol propionate	1211021-04	18
Caelo	Clobetasol propionate	121102104	1
Euro OTC	Clobetasol propionate	121121-04	1
Caelo	Clobetasol propionate	12342309	15
Caelo	Clobetasol propionate	13134701	12
Caelo	Clobetasol propionate	123645	1
Noweda	Clobetasol propionate	13134701	1
Caelo	Clobetasol propionate	13134704	4
Caelo	Clobetasol propionate	13134705	6
Fagron	Clobetasol propionate	1314705	1
Caelo	Clobetasol propionate	13269501	3
Caelo	Clobetasol propionate	13269502	2
Caelo	Clobetasol propionate	13269503	3
Noweda	Clobetasol propionate	13134705	1
Noweda/Anzag	Clobetasol propionate	13269504	3
Caelo	Clobetasol propionate	13269504	6
Caelo	Clobetasol propionate	13269505	1
Caelo	Clobetasol propionate	13269507	2
Caelo	Clobetasol propionate	13269508	11
sanacorp	Clobetasol propionate	13269508	1
Sanacorp	Clobetasol propionate	13269507	1
Phönix Caesar u. Loretz	Clobetasol propionate	13269508	1
Caelo	Clobetasol propionate	13269510	2
Caelo	Clobetasol propionate	1369504	1
Caelo	Clobetasol propionate	13269509	1
Fagron	Clobetasol propionate	13A02-N04	15
Fagron	Clobetasol propionate	13G23-N01	19
Caelo	Clobetasol propionate	13G23-N01	3
Sanacorp	Clobetasol propionate	13g23n01	1
Fagron	Clobetasol propionate	13K08-B30	2
Raben-Apotheke Mildenau	Clobetasol propionate	13k08-b30-287727	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clobetasol propionate	13K08-B30-287727	2
Fagron	Clobetasol propionate	13K08-B30-287726	2
Caelo	Clobetasol propionate	13K08-B30-287728	1
Fagron	Clobetasol propionate	13K08-B30-287728	4
Phoenix	Clobetasol propionate	13K08B30287728	1
Fagron	Clobetasol propionate	13K08-B30-287729	2
Fagron	Clobetasol propionate	13k08b30287728	1
Fagron	Clobetasol propionate	13K08-B30-287730	2
Caelo	Clobetasol propionate	13k08b30287730	1
Fagron	Clobetasol propionate	13K08B30287730	1
Euro OTC	Clobetasol propionate	1406018-01	1
Euro OTC	Clobetasol propionate	1408018-01	11
Euro OTC	Clobetasol propionate	1408015-01	1
EuRho	Clobetasol propionate	1408018-01	1
Noweda 19.05.2015	Clobetasol propionate	1408018-01	1
Euro OTC	Clobetasol propionate	140801801	1
Euro OTC	Clobetasol propionate	1408018-02	30
Allianz Healthcare 02.0...	Clobetasol propionate	1408018-01	1
Caelo	Clobetasol propionate	1408018-02	5
Noweda	Clobetasol propionate	1408018-01	1
Euro OTC	Clobetasol propionate	1408018-03	5
Caelo	Clobetasol propionate	1408018-03	4
Caelo	Clobetasol propionate	14188501	3
Euro OT	Clobetasol propionate	14081018-02	1
Euro OTC	Clobetasol propionate	140808-02	1
Caelo	Clobetasol propionate	14188502	5
Caelo	Clobetasol propionate	14188503	10
Caelo	Clobetasol propionate	14188504	5
Gehe	Clobetasol propionate	14188504	1
Caelo	Clobetasol propionate	14188506	1
Caelo	Clobetasol propionate	14338001	7
Caelo	Clobetasol propionate	14338006	5
Caelo	Clobetasol propionate	14338005	1
Farmabios S.p.A./Caesar...	Clobetasol propionate	14338006	1
Caelo	Clobetasol propionate	14338007	3
Noweda	Clobetasol propionate	14338007	1
Fagron	Clobetasol propionate	14C03-B07	6
Caelo	Clobetasol propionate	1438007	1
Caelo	Clobetasol propionate	14338008	1
Fagron	Clobetasol propionate	14C03-B07-293561	2
Fargon	Clobetasol propionate	14C03-B07	1
Fagron	Clobetasol propionate	14C03-B07-293562	7
Fagron	Clobetasol propionate	14G30-B07-302112	1
Fagron	Clobetasol propionate	14C03-B07-305987	1
Fagron	Clobetasol propionate	14G30-B07-302114	5
Caelo	Clobetasol propionate	14G30-B07-302114	1
Fagron	Clobetasol propionate	14C03-B07-293563	1
Fagron	Clobetasol propionate	14G30-B07-302115	2
Fagron	Clobetasol propionate	14G30-B07-302116	4
Fagron	Clobetasol propionate	15/15-B04-317698	1
Fagron	Clobetasol propionate	14G30-B07-303114	1
Caelo	Clobetasol propionate	15234001	2
Caelo	Clobetasol propionate	152340004	1
Caesar&Loretz GmbH	Clobetasol propionate	15234001	1
Caelo	Clobetasol propionate	15234002	1
Alliance H.	Clobetasol propionate	15234002	2
Caelo	Clobetasol propionate	15234003	7
Caelo	Clobetasol propionate	15234004	10
Noweda	Clobetasol propionate	15234004	1
Caelo	Clobetasol propionate	15234009	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Clobetasol propionate	1524003	1
Caelo	Clobetasol propionate	15246001	3
Euro OTC	Clobetasol propionate	15439501	1
Caelo	Clobetasol propionate	15439502	2
Phoenix	Clobetasol propionate	15439502	1
Caesar&Loretz GmbH	Clobetasol propionate	15439501	1
Caelo	Clobetasol propionate	15439503	8
Caelo	Clobetasol propionate	15439504	3
Caeolo/Noweda	Clobetasol propionate	15439503	1
Fagron	Clobetasol propionate	15A14-B02-303125	3
Caelo	Clobetasol propionate	15439507	1
Fagron	Clobetasol propionate	15a14-b02-303125	1
Fagron	Clobetasol propionate	15C23-B02-310473	7
Fagron	Clobetasol propionate	15c23-b02-310473	1
Fagron	Clobetasol propionate	15G01-B02-311578	1
Fagron	Clobetasol propionate	15C23-B02-310522	1
Symbiotitica/Noweda	Clobetasol propionate	1606022-01	1
Fagron	Clobetasol propionate	15J15-B04-317698	2
Caelo	Clobetasol propionate	160602201	1
Caelo	Clobetasol propionate	16106702	1
Caelo	Clobetasol propionate	1616703	1
Fagron	Clobetasol propionate	16E04-B12-321036	1
Fagron	Clobetasol propionate	16E04-B12-322020	1
Caelo	Clobetasol propionate	2185	1
Audor Pharma	Clobetasol propionate	APAPL/035/E-12C	2
Euro OTC	Clobetasol propionate	18111403	1
Caelo	Clobetasol propionate	2014E-02835	1
Fagron	Clobetasol propionate	NT0421M	5
Audor Pharma	Clobetasol propionate	APL/035/E-12C	1
Audor Pharma	Clobetasol propionate	APL035E12C	1
	Clobetasol propionate	11/29-N07	1
Euro OTC	Clobetasol propionate	1108044-02	12
Euro OTC	Clobetasol propionate	1105044-04	1
Euro OTC	Clobetasol propionate	1108044-03	19
Caelo	Clobetasol propionate	1108044-03	2
Euro OTC	Clobetasol propionate	1108044-037-16	1
Euro OTC	Clobetasol propionate	1108044-04	18
euroho/gehe	Clobetasol propionate	110804404	1
Euro OTC	Clobetasol propionate	110804404	2
Caelo	Clobetasol propionate	11300702	4
Caelo	Clobetasol propionate	11300703	5
Fagron	Clobetasol propionate	11h10-n02	2
Noweda	Clobetasol propionate	11300702	2
Fagron	Clobetasol propionate	11L12-N05	3
Caelo	Clobetasol propionate	12107602	2
Caelo	Clobetasol propionate	12107601	4
Caelo	Clobetasol propionate	12107604	2
Kehr	Clobetasol propionate	12107603	1
Gehe	Clobetasol propionate	12107606	2
Caelo	Clobetasol propionate	12107606	1
Caelo	Clobetasol propionate	12107607	9
Caelo	Clobetasol propionate	12107608	2
Caelo	Clobetasol propionate	12107609	6
Euro OTC	Clobetasol propionate	121102-01	1
Euro OTC	Clobetasol propionate	1211021-01	20
Euro OTC	Clobetasol propionate	121102101	2
Phönix	Clobetasol propionate	1211021-01	1
Caelo	Clobetasol propionate	1211021-04	1
Euro OTC	Clobetasol propionate	121K021-01	1
Caelo	Clobetasol propionate	12342303	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Clobetasol propionate	12342306	8
Caelo	Clobetasol propionate	12342308	1
Caelo	Clobetasol propionate	12342310	5
Fagron	Clobetasol propionate	12A02-N04	1
Fagron	Clobetasol propionate	12E08-N04	12
Noweda	Clobetasol propionate	12E08-N04	2
Fagron	Clobetasol propionate	12J25-N01	3
Fagron	Clobetasol propionate	12E08N04	2
Fagron	Clobetasol propionate	12e08-n04	1
Alliance Healthcare	Clobetasol propionate	12J25-N01	1
Caelo	Clobetasol propionate	13134702	8
Fagron	Clobetasol propionate	13134701	1
Fagron	Clobetasol propionate	13A-N04	2
Caelo	Clobetasol propionate	20121012-4	1
Euro OTC	Clobetasol propionate	2111I-02835	1
Caelo	Clobetasol propionate	3012Q02835	1
Fagron	Clobetasol propionate	NS0486M	2
Euro OTC	Clobetasol propionate	CL0-BL2322/1012	3
Caelo	Clobetasol propionate	23111202	1
Caelo	Clobetasol propionate	11101315	2
Anzag	Clobetasol propionate	12E08-N04	1
Phönix	Clobetasol propionate	13134701	1
GEHE	Clobetasol propionate	21022141/1	1
Caelo	Clobetasol propionate	5071301	1
Euro OTC	Clobetasol propionate	80616-1	1
Caelo	Clobetasol propionate	1004212835	1
Phönix	Clobetasol propionate		1
Euro OTC	Clobetasol propionate	1004036-03	1
Gehe	Clobetasol propionate	10D21-N04	1
Fagron	Clobetasol propionate	11-05-N06	1
Fagron	Clobetasol propionate	11/29-N07	1
Euro OTC	Clobetasol propionate	1108044	1
Euro OTC	Clobetasol propionate	1108044-01	4
Caelo	Clobetasol propionate	1108044-01	2
Phönix Gotha	Clobetasol propionate	1108044-02	1
Caelo	Clobetasol propionate	1108044-02	1
Phönix, 30.10.2012	Clobetasol propionate	1108044-03	2
Sanacorp	Clobetasol propionate	1108044-03	1
Phönix 08.03.13	Clobetasol propionate	1108044-04	3
Caelo	Clobetasol propionate	1108044-04	1
Phönix Gotha	Clobetasol propionate	1108044-04	2
Gehe	Clobetasol propionate	11300702	1
Noweda	Clobetasol propionate	11101312	1
Fagron	Clobetasol propionate	11300703	1
Caelo	Clobetasol propionate	11300704	2
Anzag	Clobetasol propionate	11H10-N02	1
Fagron	Clobetasol propionate	11D26-N04	1
Gehe	Clobetasol propionate	11L12-N05	1
Fagron	Clobetasol propionate	11H10-N02	1
Fagron	Clobetasol propionate	12/25-N01	1
Euro OTC	Clobetasol propionate	1204037-01	1
Sanacorp	Clobetasol propionate	1211021-01	1
Euro OTC	Clobetasol propionate	12110-01	1
Gehe 02.07.2013	Clobetasol propionate	1211021-01	1
euroho/gehe	Clobetasol propionate	1211021-01	1
Fagron	Clobetasol propionate	1211021-02	1
symbiotica/gehe	Clobetasol propionate	1211021-03	1
Caelo	Clobetasol propionate	12342302	1
Alliance	Clobetasol propionate	12342305	1
Caesar & Loretz/ Noweda	Clobetasol propionate	12342306	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Clobetasol propionate	12342306	1
Caelo	Clobetasol propionate	12342307	1
AHD, 24.05.2013	Clobetasol propionate	12342307	1
Noweda	Clobetasol propionate	12342310	1
Caelo	Clobetasol propionate	12342312	1
Caesar/Loretz	Clobetasol propionate	12342310	1
Fagron	Clobetasol propionate	12E08-n04	1
Gehe	Clobetasol propionate	12E08-N04	1
Gehe	Clobetasol propionate	12J25-N01	1
Euro OTC	Clobetasol propionate	130604002	1
Fagron	Clobetasol propionate	12e08n04	1
Caelo	Clobetasol propionate	12J25-N01	1
Caelo	Clobetasol propionate	13134703	3
faragon	Clobetasol propionate	13A02-N04	1
Fagron	Clobetasol propionate	13A02-N04	1
Caelo	Clobetasol propionate	13A02-N04	1
Fagron	Clobetasol propionate	13G23-N01NT0421M	1
Fagron	Clobetasol propionate	13G23N01	1
Fagron	Clobetasol propionate	13G23-N01	1
Caelo	Clobetasol propionate	15031401	1
Euro OTC	Clobetasol propionate	2405212835	1
Caelo	Clobetasol propionate	24081302	1
Fagron	Clobetasol propionate	3713M-02835	1
Euro OTC	Clobetasol propionate	700225	2
Caelo	Clobetasol propionate	36/AKD2	1
Caelo	Clobetasol propionate	31071302	1
Alliance Health 17.01.2...	Clobetasol propionate	APB00547/112010C	1
Crystal Pharma	Clobetasol propionate	C0054/1	1
Symbiotica Spec./Phönix	Clobetasol propionate	CL0-B12153/0711	1
Noweda	Clobetasol propionate	NR0671M	1
Fagron	Clobetasol propionate	NS0292-M	1
Fagron	Clobetasol propionate	NR0671M	1
noweda	Clobetasol propionate	1004036-03	1
Symbiotica	Clobetasol propionate	121021-01	1
Sanacorp	Clobetasol propionate	12107609	2
Sanacorp	Clobetasol propionate	12342310	1
Caelo	Clobetasol propionate	14102416	1

- 55 270 spectra from 334 *Apo-Ident* customers from a total of 20 432 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clobetasol propionate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clobetasol propionate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	466	0	75 412
Type B	0	329	67	80 952
Type C	0	661	70	55 270

The substance/substance group *Clobetasol propionate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.7124 %)
Type B	100.0000 % (> 99.9853 %)	83.0808 % (> 82.3232 %)
Type C	100.0000 % (> 99.8622 %)	90.4241 % (> 90.0137 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21092	21092	0.00	12.23
21473	21473	0.00	14.91
21611	21611	0.00	14.71
21802	21802	0.00	15.48
21896	21896	0.00	12.05
22714	22714	0.00	14.45
22724	21092	3.07	11.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clonidine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20637-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Clonidine hydrochloride; Clonidini hydrochloridum; Clonidinum hydrochloricum

Special notes

When selecting the *Clonidine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clonidine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Clonidine hydroc...	12A03-N04	20637	40	1401149
Fagron	Clonidine hydroc...	13I25-B07	21220	40	20131009
Fagron	Clonidine hydroc...	14H11-B04-311163	21966	40	20140929
Fagron	Clonidine hydroc...	14H11-B04-311163	22967	40	20140929
Fagron	Clonidine hydroc...	14H11-B04-311163	21966SI	40	20140929
Fagron	Clonidine hydroc...	14H11-B04-311163	22967SI	40	20140929

Validation samples

A total of 213 227 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 *Clonidine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 82 spectra of 3 reference samples from the substance/substance group *Clonidine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Clonidine hydrochloride	14H11-B04-311163	21966 [†]	20
Fagron	Clonidine hydrochloride	14H11-B04-311163	not required	42
Fagron	Clonidine hydrochloride	14H11-B04-311163	21966SI [†]	20

- 81 266 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Clonidine hydrochloride*.

[†]These spectra were recorded from 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
Fagron	Clonidine hydrochloride	14H11-B04-298642	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clonidine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clonidine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	82	0	81 266
Type C	0	1	0	56 000

The substance/substance group *Clonidine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.6829 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20637	20637	0.00	56.04
21220	20637	11.81	61.70
21966	20637	6.74	52.29
22967	20637	15.84	60.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Clotrimazole**
 Substance class APIs & excipients, solid
 Report date 12/04/2017
 Report number 20000-2017-04-12
 Executing company HiperScan GmbH
 Weißeritzstraße 3
 01067 Dresden
 Germany

Relevant substance names

Clotrimazole; Clotrimazolum

Special notes

When selecting the *Clotrimazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Clotrimazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Clotrimazole	91457249	20000	30	I 2009 000 254
Fagron	Clotrimazole	12I21-N01	20794	40	20120322
Caelo	Clotrimazole	13184113	21087	40	20130614
Caelo	Clotrimazole	13224204	21114	40	20130815
Euro OTC	Clotrimazole	1306036-01	21207	40	20130823
Fagron	Clotrimazole	14B05-B36	21259	40	20140225
Fagron	Clotrimazole	14C04-B31	21264	40	20140319
Caelo	Clotrimazole	13224220	21352	40	20130815
Euro OTC	Clotrimazole	1510003	22229	40	20151111*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 350 spectra of 9 reference samples from the substance/substance group *Clotrimazole*. These samples are listed above in the [calibration samples](#) section.
- 75 528 spectra from a total of 1567 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 130 spectra of 4 reference samples from the substance/substance group *Clotrimazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Clotrimazole	12320815	20861	30
Caelo	Clotrimazole	13224220	21353	40
Euro OTC	Clotrimazole	1510003	22229 [†]	20
Euro OTC	Clotrimazole	1607046	22793	40

- 81 218 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1073 spectra from 250 *Apo-Ident* customers from 247 batches from the substance/substance group *Clotrimazole*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	6051501	1
Sanacorp	Clotrimazole	105/AKD1	1
Sanacorp	Clotrimazole	109/AKD3	1
Pharmachem.Pößneck/Phoe...	Clotrimazole	12100039-02	1
Caelo	Clotrimazole	108/AKD1	1
Sanacorp	Clotrimazole	109/AKD6	1
Euro OTC	Clotrimazole	1210039-02	22
Euro OTC	Clotrimazole	121003901	3
Fagron	Clotrimazole	1210039-02	1
EuRho/Phoenix	Clotrimazole	1210039-02	1
Caelo	Clotrimazole	12159902	14
Euro OTC	Clotrimazole	1306036	2
Caelo	Clotrimazole	1306036-01	5
Euro OTC	Clotrimazole	1306036-01	41
Euro OTC	Clotrimazole	130603601	3
Euro OTC	Clotrimazole	130636-01	2
Euro OTC	Clotrimazole	1309034-01	13
Fagron	Clotrimazole	1309034-01	3
Euro OTC	Clotrimazole	130903401	3
Alliance Healthcare	Clotrimazole	1309034-01	1
Gehe	Clotrimazole	1309034-01	2
Caelo	Clotrimazole	1309034-01	1
Euro OTC	Clotrimazole	1309034-02	17
EuRho	Clotrimazole	1309034-02	1
Euro OTC	Clotrimazole	130903402	1
Caelo	Clotrimazole	1309034-02	3
Caelo	Clotrimazole	1309034-C1	1
Phoenix	Clotrimazole	1309034-02	1
Caelo	Clotrimazole	132234216	1
Euro OTC	Clotrimazole	1309054-02	1
Caelo	Clotrimazole	13224204	2
Euro OTC	Clotrimazole	1314Q1276	1
Caelo	Clotrimazole	13224210	9
Sino Phyto	Clotrimazole	13224210	2
Caelo	Clotrimazole	13224211	5
Caelo	Clotrimazole	13224212	7
Caelo	Clotrimazole	13224214	10
gehe	Clotrimazole	13224212	1
Sanacorp	Clotrimazole	13224214	2
Caelo	Clotrimazole	13224215	2
Caelo	Clotrimazole	13224216	8
Caelo	Clotrimazole	13224217	8
Noweda	Clotrimazole	13224217	1
Caelo	Clotrimazole	13224218	8
Caelo	Clotrimazole	13224219	6
Sanacorp	Clotrimazole	13224219	1
Caelo	Clotrimazole	13224220	2
Caelo	Clotrimazole	13224225	3
Caelo	Clotrimazole	13224221	1
Euro OTC	Clotrimazole	1409027	4
Caelo	Clotrimazole	13324204	1
Euro OTC	Clotrimazole	1409027-01	19
Euro OTC	Clotrimazole	140902701	2
EuRho	Clotrimazole	1409027-01	2
EuRho/Phoenix	Clotrimazole	1409027-01	1
Euro OTC	Clotrimazole	1409027-02	26
Euro / Phönix	Clotrimazole	1409027-02	1
Caelo	Clotrimazole	1409027-02	2
Euro OTC	Clotrimazole	140902702	2
Fagron	Clotrimazole	1409027-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	1409027-03	9
Caelo	Clotrimazole	1409027-03	2
Guangzhou Hanpu Pharmac...	Clotrimazole	1409027-03	1
Euro OTC	Clotrimazole	1409027-04	11
Caelo	Clotrimazole	1409027-04	1
Dr. Wolff	Clotrimazole	1409027-04	2
Caelo	Clotrimazole	14144905	13
Sanacorp	Clotrimazole	14144905	1
Euro OTC	Clotrimazole	140927-01	1
Caelo	Clotrimazole	14144912	2
Caelo	Clotrimazole	14144911	6
Caelo	Clotrimazole	14144914	4
Caelo	Clotrimazole	14144913	1
Euro OTC	Clotrimazole	14144914	1
Caelo	Clotrimazole	14144917	6
Noweda 07.07.2015	Clotrimazole	14144913	1
Caelo	Clotrimazole	14144918	9
Fagron	Clotrimazole	14223201	1
sanacorp	Clotrimazole	14144918	1
Berkel AHK	Clotrimazole	14337801	1
Caelo	Clotrimazole	14337801	7
A.H.D.	Clotrimazole	14337801	1
Noweda	Clotrimazole	14337801	1
Caelo	Clotrimazole	14337802	6
Caelo	Clotrimazole	14337807	4
Caesar&Loretz GmbH/Anzag	Clotrimazole	14337807	1
Caelo	Clotrimazole	14337809	8
AHD/Hedinger	Clotrimazole	14337807	1
Phönix Gotha	Clotrimazole	14337811	1
Caelo	Clotrimazole	14337811	4
Caelo	Clotrimazole	14337812	3
Caelo	Clotrimazole	14337813	4
Caesar&Loretz GmbH	Clotrimazole	14337814	1
Noweda	Clotrimazole	14337816	1
Caelo	Clotrimazole	14337815	3
Caelo	Clotrimazole	14337814	3
Caelo	Clotrimazole	14337816	4
Caelo	Clotrimazole	14337817	8
Sanacorp	Clotrimazole	14337817	1
Caelo	Clotrimazole	14337818	6
Euro OTC	Clotrimazole	14337819	1
Caelo	Clotrimazole	14337819	3
Caelo	Clotrimazole	14337824	1
Caelo	Clotrimazole	14337828	6
Caelo	Clotrimazole	14337829	13
Caelo	Clotrimazole	14337830	1
Fagron	Clotrimazole	14B05-B35	2
Fagron	Clotrimazole	14B05-B35-293544	5
Caelo	Clotrimazole	14B05-B35	1
Fagron	Clotrimazole	14B05-B35-293542	3
Fagron	Clotrimazole	14B05-B35-294935	2
Fagron	Clotrimazole	14B05-B35-294932	1
Fagron	Clotrimazole	14B05-B35-299941	2
Fagron	Clotrimazole	14B05-B36	8
Fagron	Clotrimazole	14B05B35294935	1
Apomix	Clotrimazole	14B05-B36	1
Fagron	Clotrimazole	14B05-B36-291165	3
Fagron	Clotrimazole	14B05-B36-291166	2
Fagron	Clotrimazole	14b05b36291166	1
Fagron	Clotrimazole	14b05-b36-291166	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clotrimazole	14B05-B36-291167	5
Caelo	Clotrimazole	14B05-B36-291167	1
Fagron	Clotrimazole	14B05-B36-291168	2
Fagron	Clotrimazole	14B06-B06	1
Fagron	Clotrimazole	14B06-B06-299942	1
Fagron	Clotrimazole	14B06-B06-299943	4
Fagron	Clotrimazole	14C04-B30	2
Caelo	Clotrimazole	14c04-b30-291656	1
Fagron	Clotrimazole	14C04-B30-291656	6
Caelo	Clotrimazole	14C04-B30-291656	2
Fagron	Clotrimazole	14C04-B31	5
Fagron	Clotrimazole	14C04B31	1
Phoenix	Clotrimazole	14c04b31	1
Caelo	Clotrimazole	14c04-B31	1
Fagron	Clotrimazole	14C04-B31-291660	2
Euro OTC	Clotrimazole	14C04-B31-291660	1
Fagron	Clotrimazole	14C04-B31-294939	6
Caelo	Clotrimazole	14C04-B31-294939	1
Fagron	Clotrimazole	14C04-B31-294952	1
Fagron	Clotrimazole	14C04-B31-294940	1
Gehe	Clotrimazole	14C04-B31-294952	1
Caelo	Clotrimazole	14C04B31-299954	1
Fagron	Clotrimazole	14C04-B31-299954	6
Caelo	Clotrimazole	14C04-B31-299955	1
Fagron	Clotrimazole	14C04-B31-299960	4
Fagron	Clotrimazole	14C04-B31-299955	1
Euro OTC	Clotrimazole	1510003-01	20
Caelo	Clotrimazole	14C04-B32-291657	1
Fagron	Clotrimazole	14C04B32291657	1
Guangzhou Hanpu Pharmac...	Clotrimazole	1510003-01	1
Fagron	Clotrimazole	1510003-01	1
Euro OTC	Clotrimazole	1510003-02	5
Guangzhou Hanpu Pharmac...	Clotrimazole	1510003-02	1
Caelo	Clotrimazole	15395602	4
Euro OTC	Clotrimazole	151003-01	1
Caelo	Clotrimazole	15395603	2
Caelo	Clotrimazole	15395604	5
Euro OTC	Clotrimazole	15395604	1
Caelo	Clotrimazole	15395605	3
Caelo	Clotrimazole	15395611	4
Anzag	Clotrimazole	15395610	1
Caelo	Clotrimazole	15395613	1
Hedinger/Alliance H.	Clotrimazole	15395617	1
Caelo	Clotrimazole	15395614	1
Caelo	Clotrimazole	15395615	1
Caelo	Clotrimazole	15395618	1
Caelo	Clotrimazole	15395617	1
Caelo	Clotrimazole	153965604	1
Fagron	Clotrimazole	15C14-B05-311100	1
Fagron	Clotrimazole	15G14-B05	1
Gehe	Clotrimazole	15G14-B05	1
Caelo	Clotrimazole	15G14-B05-311101	1
Fagron	Clotrimazole	15G14-B05-311103	3
Fagron	Clotrimazole	15G14-B05-311100	1
apomix/Phönix	Clotrimazole	15G14-B05-311103	3
Caelo	Clotrimazole	15G14-B05-316483	1
Fagron	Clotrimazole	15G14-B06	1
Fagron	Clotrimazole	15G14B06311054	1
Euro OTC	Clotrimazole	1607046-01	9
Fagron	Clotrimazole	15G14-B06-311055	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clotrimazole	15G14-B06-311054	1
Fagron	Clotrimazole	15g14-b06-311054	1
Fagron	Clotrimazole	16B09-B06	1
Caelo	Clotrimazole	1607046-01	1
Caelo	Clotrimazole	16234504	2
Fagron	Clotrimazole	16B09-B06-311507	2
Oberlinden Apotheke	Clotrimazole	201401300378	2
Caelo	Clotrimazole	17011601	1
Euro OTC	Clotrimazole	2214A-01276	1
Fagron	Clotrimazole	CLT/1307/0065A	2
Caelo	Clotrimazole	Fagron	1
Audor Pharma	Clotrimazole	AP1306036-01C	1
Fagron	Clotrimazole	9041304	1
Caelo	Clotrimazole	415050-2-P	1
Euro OTC	Clotrimazole	23121408	1
Caelo	Clotrimazole	418072-1-P	1
Caelo	Clotrimazole		6
Caelo	Clotrimazole	1882321	1
Caelo	Clotrimazole	311111	1
Euro OTC	Clotrimazole	1006044-02	1
Caelo	Clotrimazole	10247328	3
Noweda	Clotrimazole	10247316	1
Kehr	Clotrimazole	10247332	2
Gehe	Clotrimazole	10247328	1
Kehr	Clotrimazole	10247331	1
Caelo	Clotrimazole	10247332	1
Euro OTC	Clotrimazole	1105014-01	1
Euro OTC	Clotrimazole	1105014-02	3
Caelo	Clotrimazole	11/22-N10	1
Euro OTC	Clotrimazole	110501402	1
Caelo	Clotrimazole	1105014-02	1
Phönix Gotha	Clotrimazole	1108053-01	2
Euro OTC	Clotrimazole	110805301	1
Euro OTC	Clotrimazole	1108053-02	6
Gehe	Clotrimazole	1108053-01	1
Euro OTC	Clotrimazole	1108053-01	5
Phönix Gotha	Clotrimazole	1108053-02	2
Caelo	Clotrimazole	1108053-02	1
EuRho	Clotrimazole	1108053-02	1
Fagron	Clotrimazole	11101209	1
Caelo	Clotrimazole	11081201	1
Caelo	Clotrimazole	11305505	2
Caelo	Clotrimazole	11305506	3
Caelo	Clotrimazole	11305507	2
phönix	Clotrimazole	11305513	1
Caelo	Clotrimazole	11305513	9
Fagron	Clotrimazole	11A05-N14	1
Fagron	Clotrimazole	11D01-N06	1
Caelo	Clotrimazole	11-K21-N19	1
Fagron	Clotrimazole	11E17-N10	3
Fagron	Clotrimazole	11K21-N19	1
Gehe	Clotrimazole	11K21-N19	2
Noweda	Clotrimazole	11K21-N19	2
Fagron	Clotrimazole	11G15-N10	1
Fagron	Clotrimazole	11k21-n19	1
Fagron	Clotrimazole	11L12-N10	4
Fagron	Clotrimazole	12/21-N01	5
FARGON	Clotrimazole	11112-n10	1
Großhandel	Clotrimazole	12/21-N04	1
Fagron	Clotrimazole	12/21-N04	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	1203040	1
Euro OTC	Clotrimazole	1203040-01	3
Anzag,12.11.2012	Clotrimazole	1203040	1
Europharm/Otto	Clotrimazole	1203040-01	1
Euro OTC	Clotrimazole	1203040-02	10
Europharm/Otto	Clotrimazole	1203040-02	1
EuRho	Clotrimazole	1203040-02	1
Gehe	Clotrimazole	1203040-02	1
Sanacorp	Clotrimazole	1203040-03	1
Euro OTC	Clotrimazole	1203040-03	10
Anzag 30.01.2013	Clotrimazole	1203040-03	2
Noweda	Clotrimazole	1203040-03	2
Gehe/EuRho	Clotrimazole	1203040-03	1
GEHE	Clotrimazole	1203040-03	1
Euro OTC	Clotrimazole	1209211276	1
Euro OTC	Clotrimazole	1210039-01	25
Phönix	Clotrimazole	1210039-01	1
Fagron	Clotrimazole	1210039-01	1
Caelo	Clotrimazole	1210039-01	1
Euro/Noweda	Clotrimazole	1210039-01	1
Phönix, 28.10.2013	Clotrimazole	1210039-02	1
Caelo	Clotrimazole	1210039-02	1
Gehe	Clotrimazole	121003902	1
EuRho/Phönix	Clotrimazole	1210039-2	1
Stumpf	Clotrimazole	12159902	1
Caelo	Clotrimazole	12159904	2
Kehr	Clotrimazole	12159904	1
Caelo	Clotrimazole	12159913	9
Phönix/ henry lamotte	Clotrimazole	12159911	1
Caelo	Clotrimazole	12159911	2
Caelo	Clotrimazole	12159916	6
Fagron	Clotrimazole		2
Fagron	Clotrimazole	1221n04	1
Fagron	Clotrimazole	1221N04	1
Sanacorp	Clotrimazole	1230805	1
Caelo	Clotrimazole	1230809	1
Caelo	Clotrimazole	12320806	6
Caelo	Clotrimazole	12320805	4
Caelo	Clotrimazole	12320807	4
Caelo	Clotrimazole	12320808	9
Caelo	Clotrimazole	12320809	2
Caelo	Clotrimazole	12320813	3
phönix	Clotrimazole	12320809	1
Caelo	Clotrimazole	12320814	9
Caelo	Clotrimazole	12320815	3
Caelo	Clotrimazole	1234567	1
Fagron	Clotrimazole	12A05-N10	6
Bombastus	Clotrimazole	12320815	1
Caelo	Clotrimazole	1259913	1
Caelo	Clotrimazole	12B27-N05	2
Phoenix	Clotrimazole	12A05-N10	1
Fagron	Clotrimazole	12a05-n10	1
Fagron	Clotrimazole	12B27-N05	4
Fagron	Clotrimazole	12E02-N12	10
Noweda	Clotrimazole	12E02-N12	1
Fagron	Clotrimazole	12e02-N12	1
Fagron	Clotrimazole	12E30-N07	12
Caelo	Clotrimazole	12E30-N07	1
Fiebig 10.06.13 ek: 8,58EUR	Clotrimazole	12E30-N07	1
Fagron	Clotrimazole	12I21-N01	7

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Clotrimazole	12I21-N01	1
Fagron	Clotrimazole	12I16-N04	1
Fagron	Clotrimazole	12F02-N12	1
Fagron	Clotrimazole	12I21-N04	7
Fagron	Clotrimazole	12I21N04	1
FARGON	Clotrimazole	12i21-n04	1
anzag,18.01.2013	Clotrimazole	12I21-N04	1
Caelo	Clotrimazole	12I21-N04	1
Fagron	Clotrimazole	12K15-N01	1
Fagron	Clotrimazole	12I21-N04	2
FARGON	Clotrimazole	12I21-n04	1
Fagron	Clotrimazole	12I21-n04	1
Gehe/EuRho	Clotrimazole	12o3040-03	1
Gehe	Clotrimazole	1306036-01	4
EuRho	Clotrimazole	1306036-01	2
Großhandel	Clotrimazole	1306036-01	1
PHOENIX am 22.01.2014	Clotrimazole	1306036-01	1
	Clotrimazole	1306036-01	1
Caelo	Clotrimazole	13148007	1
Caelo	Clotrimazole	13184103	13
Caelo	Clotrimazole	13184105	14
Gehe	Clotrimazole	13184103	1
Sanacorp	Clotrimazole	13184105	1
Caelo	Clotrimazole	13184111	7
Caesar&Loretz GmbH/Anzag	Clotrimazole	13184111	1
Caelo	Clotrimazole	131841111	1
Caelo	Clotrimazole	13224201	18
Caelo	Clotrimazole	13184113	3
Noweda	Clotrimazole	13224201	1
Gehe	Clotrimazole	13224216	1
Phoenix	Clotrimazole	13224215	1
Fagron	Clotrimazole	13C25-N10	10
Phönix	Clotrimazole	13C25-N10	1
Phönix	Clotrimazole	14337809	1
Caesar&loretz,Phoenix	Clotrimazole	14144912	1
Caelo	Clotrimazole	14337827	1
Fagron	Clotrimazole	20111018	4
Fagron	Clotrimazole	20110113	1
Caelo	Clotrimazole	20111018	1
Caelo	Clotrimazole	20111115	1
Fischar/Gehe	Clotrimazole	20111018	1
Sanacorp	Clotrimazole	20111018	1
Euro OTC	Clotrimazole	20111115	1
Fagron	Clotrimazole	20120603	4
Noweda	Clotrimazole	20111115	1
Euro OTC	Clotrimazole	2313M01276	1
Caelo	Clotrimazole	20130207	1
Caelo	Clotrimazole	26071305	1
Fagron	Clotrimazole	20151112-3	1
Caelo	Clotrimazole	3513M-01276	1
Euro OTC	Clotrimazole	30011402	1
Euro OTC	Clotrimazole	3912E-01276	1
Fagron	Clotrimazole	4812E-01276 (NP)	1
Caelo	Clotrimazole	412091-2-P	1
Euro OTC	Clotrimazole	700135	1
Caelo	Clotrimazole	700135-0006	1
Fagron	Clotrimazole	C22H17CIN2	1
Gehe	Clotrimazole	12/21-N01	1
EUro/AHD	Clotrimazole	1210039-01	2
Sanacorp	Clotrimazole	12320814	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Clotrimazole	12b27-n05	1
Fagron	Clotrimazole	12E02N12	1
Anzag	Clotrimazole	12I21-N04	1
europharma	Clotrimazole	1306036-01	1
Fagron	Clotrimazole	13224201	1
AHD	Clotrimazole	13184105	1

- 54 928 spectra from 335 *Apo-Ident* customers from a total of 20 366 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Clotrimazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Clotrimazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	350	0	75 528
Type B	0	130	0	81 218
Type C	0	1069	4	54 928

The substance/substance group *Clotrimazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.2857 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.3846 %)
Type C	100.0000 % (> 99.8622 %)	99.6272 % (> 99.3476 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20000	20000	0.00	44.74
20794	22229	2.22	47.42
21087	22229	2.83	46.54
21114	22229	3.46	45.79
21207	22229	5.06	44.52
21259	22229	5.54	41.37
21264	22229	4.89	42.78
21352	22229	3.48	46.87
22229	22229	0.00	48.05

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Colistin sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20318-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Colistin sulfate; Colistin sulphate; Colistini sulfas; Colistinum sulfuricum

Special notes

When selecting the *Colistin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Colistin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Colistin sulfate	07I18-N05	20318	40	AR-12-FG-008034-01
Fagron	Colistin sulfate	13G05-N01	20915	40	20130719
Fagron	Colistin sulfate	14E02-B03	21346	40	1501654
Euro OTC	Colistin sulfate	1406001-01	21619	40	1508600
Euro OTC	Colistin sulfate	1507044	21852	40	20150817*
Euro OTC	Colistin sulfate	1602021	22371	40	20160307*
Euro OTC	Colistin sulfate	1606008	22695	40	20160704*
Fagron	Colistin sulfate	16F03-B01-324216	22973	40	20160706

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Colistin sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 558 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 185 spectra of 6 reference samples from the substance/substance group *Colistin sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Colistin sulfate	13G05-N01	21209	40
Euro OTC	Colistin sulfate	1406001-01	21619 [†]	20
Euro OTC	Colistin sulfate	1406002-01	21700	45
Euro OTC	Colistin sulfate	1507044	21852 [†]	20
Euro OTC	Colistin sulfate	1602021	22371 [†]	20
Audor Pharma	Colistin sulfate	APKB-CS-1602026C	22974	40

- 81 163 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Colistin sulfate*.

Supplier	Substance	Batch	Spectra
Fagron	Colistin sulfate	15E15-B01-315340	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Colistin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Colistin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	75 558
Type B	0	185	0	81 163
Type C	0	1	0	56 000

The substance/substance group *Colistin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.7568 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20318	20318	0.00	24.20
20915	21619	5.72	26.86
21346	21346	0.00	28.22
21619	21619	0.00	28.38
21852	21852	0.00	27.68
22371	22371	0.00	25.13
22695	22695	0.00	27.00
22973	21852	2.16	26.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Colophony
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20627-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Colophony; Colophonium

Special notes

When selecting the *Colophony* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Colophony*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Colophony	10147506	20627	40	1402095
Caelo	Colophony	12301410	21782	40	AR-15-FG-016314-01
Caelo	Colophony	15186804	21971	40	AR-16-FG-005931-01
Caelo	Colophony	161332	22588	40	20160510*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Colophony*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 48 spectra of 3 reference samples from the substance/substance group *Colophony*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Colophony	12301410	21782 [†]	20
Caelo	Colophony	15186804	21971 [†]	20
Fagron	Colophony	15186807	not required	8

- 81 300 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Colophony*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Colophony* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Colophony* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	46	2	81 300
Type C	0	0	0	56 001

The substance/substance group *Colophony* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	95.8333 % (> 89.5833 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20627	20627	0.00	41.23
21782	21782	0.00	60.03
21971	21971	0.00	35.22
22588	22588	0.00	58.24

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cyanocobalamin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21299-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cyanocobalamin; Cyanocobalaminum

Special notes

When selecting the *Cyanocobalamin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cyanocobalamin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Cyanocobalamin	13342803	21299	40	AR-15-FG-005429-01
Caelo	Cyanocobalamin	13342807	21479	40	AR-15-FG-014917-01
Euro OTC	Cyanocobalamin	1305040-01	21635	40	AR-15-FG-005214-01
Euro OTC	Cyanocobalamin	1506035	21867	40	20150708*
Euro OTC	Cyanocobalamin	1506035	21872	40	0000010479
Caelo	Cyanocobalamin	160154	22441	40	20160309*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cyanocobalamin	1604017	22536	30	20160509*
Caelo	Cyanocobalamin	13342807	21479SI	20	AR-15-FG-014917-01
Euro OTC	Cyanocobalamin	1506035	21867SI	40	20150708*
Euro OTC	Cyanocobalamin	1506035	21872SI	30	0000010479
Caelo	Cyanocobalamin	160154	22441SI	40	20160309*
Euro OTC	Cyanocobalamin	1604017	22536SI	40	20160509*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 12 reference samples from the substance/substance group *Cyanocobalamin*. These samples are listed above in the [calibration samples](#) section.
- 75 438 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 235 spectra of 10 reference samples from the substance/substance group *Cyanocobalamin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Cyanocobalamin	9351704	20858	40
Caelo	Cyanocobalamin	13342807	21479 [†]	20
Euro OTC	Cyanocobalamin	1305040-01	21635 [†]	20
Euro OTC	Cyanocobalamin	1506035	21867 [†]	20
Euro OTC	Cyanocobalamin	1506035	21872 [†]	20
Caelo	Cyanocobalamin	160154	22441 [†]	20
Caelo	Cyanocobalamin	13342807	21479SI [†]	40
Euro OTC	Cyanocobalamin	1506035	21867SI [†]	20
Euro OTC	Cyanocobalamin	1506035	21872SI [†]	15
Caelo	Cyanocobalamin	160154	22441SI [†]	20

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 113 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 11 *Apo-Ident* customers from 10 batches from the substance/substance group *Cyanocobalamin*.

Supplier	Substance	Batch	Spectra
Euro OTC	Cyanocobalamin	5061204	1
Fagron	Cyanocobalamin	10K02-N05	4
Caesar & Loretz GmbH, 4...	Cyanocobalamin	9324102	1
Caelo	Cyanocobalamin	9351704	1
Fagron	Cyanocobalamin	10K02-N05	1
Caelo	Cyanocobalamin	9324102	1
Fagron	Cyanocobalamin	13124-B01-292062	1
Caelo	Cyanocobalamin	9373503	2
Caelo	Cyanocobalamin	9336904	1
Caelo	Cyanocobalamin	9324113	1
Caelo	Cyanocobalamin	9336907	1

- 55 986 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cyanocobalamin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cyanocobalamin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	440	0	75 438
Type B	0	235	0	81 113
Type C	0	11	4	55 986

The substance/substance group *Cyanocobalamin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.4468 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21299	21299	0.00	19.38
21479	21479	0.00	26.99
21635	21635	0.00	23.76
21867	21867	0.00	22.02
21872	21872	0.00	31.39
22441	22441	0.00	29.59
22536	22536	0.00	26.51

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cyproterone acetate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20593-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cyproterone acetate; Cyproteroni acetat; Cyproteronum aceticum

Special notes

When selecting the *Cyproterone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cyproterone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Cyproterone acet...	12B14-N06	20593	30	1401557
Fagron	Cyproterone acet...	13C11-N02	21262	40	1501534
Fagron	Cyproterone acet...	13J16-No4	21985	55	1602654
Fagron	Cyproterone acet...	15I11-B01-322117	22665	40	20150921
Euro OTC	Cyproterone acet...	1611003	22875	40	20161201*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 205 spectra of 5 reference samples from the substance/substance group *Cyproterone acetate*. These samples are listed above in the [calibration samples](#) section.
- 75 673 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 156 spectra of 6 reference samples from the substance/substance group *Cyproterone acetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Cyproterone acetate	12B14-N06	20593 [†]	10
Fagron	Cyproterone acetate	11L22-N02	20603	40
Fagron	Cyproterone acetate	13J16-No4	21985 [†]	20
Fagron	Cyproterone acetate	13J16-No4	21985SI	23
Fagron	Cyproterone acetate	15I11-B01-322117	22665SI	33
Euro OTC	Cyproterone acetate	1611003	22875SI	30

- 81 192 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 24 spectra from 13 *Apo-Ident* customers from 14 batches from the substance/substance group *Cyproterone acetate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Cyproterone acetate	8B11-N06	1
Fagron	Cyproterone acetate	12L19-N05	2
Fagron	Cyproterone acetate	13/09-N03	1
Fagron	Cyproterone acetate	13/16-N04	2
Fagron	Cyproterone acetate	13J16-N04	4
Fagron	Cyproterone acetate	13I09-N03	1
Fagron	Cyproterone acetate	13j16n04	1
Audor Pharma	Cyproterone acetate	APCPA140201CP	1
Fagron	Cyproterone acetate	APCPA130201C	1
Fagron	Cyproterone acetate	B0392/110020	2
Caelo	Cyproterone acetate	B0392/110020	3
Caelo	Cyproterone acetate	CPA150301	1
Fagron	Cyproterone acetate	11L22-N02	1
Fagron	Cyproterone acetate	12F25-N09	2
Fagron	Cyproterone acetate	12D02-N13	1

- 55 977 spectra from 335 *Apo-Ident* customers from a total of 20 597 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cyproterone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cyproterone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	205	0	75 673
Type B	0	143	13	81 192
Type C	0	18	6	55 977

The substance/substance group *Cyproterone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0732 %)
Type B	100.0000 % (> 99.9853 %)	91.6667 % (> 89.7436 %)
Type C	100.0000 % (> 99.8622 %)	75.0000 % (> 62.5000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20593	20593	0.00	42.52
21262	21262	0.00	44.86
21985	21985	0.00	41.70
22665	21985	7.59	42.86
22875	22875	0.00	45.37

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Cysteine hydrochloride monohydrate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20530-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Cysteine hydrochloride monohydrate; Cysteinum hydrochloricum

Special notes

When selecting the *Cysteine hydrochloride monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cysteine hydrochloride monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cysteine hydroch...	1112015-01	20530	40	AR-13-FG-009216-01
Euro OTC	Cysteine hydroch...	1112015-02	20630	40	20120510
Euro OTC	Cysteine hydroch...	1304019-01	21325	40	20130517
Euro OTC	Cysteine hydroch...	1507006	21840	40	0000010551
Euro OTC	Cysteine hydroch...	1701012	23003	40	20170207*

Validation samples

A total of 213 227 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 *Cysteine hydrochloride monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Cysteine hydrochloride monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Cysteine hydrochloride monoh...	P-07014800	20422	40
Euro OTC	Cysteine hydrochloride monoh...	1507006	21840 [†]	20
Euro OTC	Cysteine hydrochloride monoh...	1510015	21941	60
Euro OTC	Cysteine hydrochloride monoh...	1603018	22516	40

- 81 188 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 17 spectra from 4 *Apo-Ident* customers from 7 batches from the substance/substance group *Cysteine hydrochloride monohydrate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Cysteine hydrochloride monoh...	1311040-01	2
Euro OTC	Cysteine hydrochloride monoh...	1408003-01	4
Euro OTC	Cysteine hydrochloride monoh...	14080031-01	1
Euro OTC	Cysteine hydrochloride monoh...	1112015-01	2
Euro OTC	Cysteine hydrochloride monoh...	1206015-01	2
Euro OTC	Cysteine hydrochloride monoh...	1304019-01	5
Euro OTC	Cysteine hydrochloride monoh...	1603018-01	1

- 55 984 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cysteine hydrochloride monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cysteine hydrochloride monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	160	0	81 148
Type C	0	17	0	55 977

The substance/substance group *Cysteine hydrochloride monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20530	20530	0.00	48.02
20630	23003	3.38	47.69
21325	21840	4.12	35.41
21840	21840	0.00	36.64
23003	23003	0.00	40.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Cystine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20515-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Cystine; Cystinum

Special notes

When selecting the *Cystine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Cystine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Cystine	1104017-01	20515	40	AR-13-FG-002772-01
Euro OTC	Cystine	1307052-01	21328	40	20130918
Euro OTC	Cystine	1408016-01	21715	40	20140911
Euro OTC	Cystine	1603010	22523	40	20160406*
Euro OTC	Cystine	1610013	22863	40	20161110*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Cystine*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Cystine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Cystine	1408016-01	21715 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 3 *Apo-Ident* customers from 6 batches from the substance/substance group *Cystine*.

Supplier	Substance	Batch	Spectra
Euro OTC	Cystine	2081301	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Euro OTC	Cystine	3021502	1
Euro OTC	Cystine	1204090	1
Euro OTC	Cystine	1207013-01	3
Fagron	Cystine	12D26-B04-285823	2
Euro OTC	Cystine	26081408	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Cystine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Cystine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	20	0	81 328
Type C	0	9	0	55 992

The substance/substance group *Cystine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20515	20515	0.00	30.36
21328	22863	5.81	30.24
21715	22523	4.00	30.27
22523	22523	0.00	30.75
22863	22863	0.00	30.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Dapsone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22489-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dapsone; Dapsonum

Special notes

When selecting the *Dapsone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dapsone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dapsone	160735	22489	40	20160405*
Caelo	Dapsone	16073502	22736	40	20160405

Validation samples

A total of 213 227 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 *Dapsone*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Dapsone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dapsone	160735	22489 [†]	20
Caelo	Dapsone	16073502	22577	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Dapsone*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dapsone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dapsone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	0	0	56 001

The substance/substance group *Dapsone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22489	22489	0.00	88.65
22736	22489	25.51	91.32

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Deoxycholic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20412-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Deoxycholic acid; Deoxycholic acidum

Special notes

When selecting the *Deoxycholic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Deoxycholic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
New Zealand P...	Deoxycholic acid	0411656	20412	40	AR-12-FG-009964-01
New Zealand P...	Deoxycholic acid	0411656	20537	40	20110622
Fagron	Deoxycholic acid	14A02-B32-303429	21967	40	AR-16-FG-004648-01
Euro OTC	Deoxycholic acid	1305051-01	22575	40	20130611
Fagron	Deoxycholic acid	14A02-B32-303429	23014	40	20140116

Validation samples

A total of 213 227 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 *Deoxycholic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Deoxycholic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Deoxycholic acid	14A02-B32-303429	21967 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 batches from the substance/substance group *Deoxycholic acid*.

Supplier	Substance	Batch	Spectra
SAFICALCAN	Deoxycholic acid	413678	1
GEHE 21.10.2014	Deoxycholic acid	13F13-N06	1
Fagron	Deoxycholic acid	13J21-N14	1
Fagron	Deoxycholic acid	12L14-N07	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
Gehe	Deoxycholic acid	2012060253	1
new zealand pharmaceuti...	Deoxycholic acid	411656	1
Euro OTC	Deoxycholic acid	1305051-01	1

- 55 994 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Deoxycholic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Deoxycholic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	20	0	81 328
Type C	0	6	1	55 994

The substance/substance group *Deoxycholic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20412	20412	0.00	34.68

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20537	20412	7.52	36.73
21967	21967	0.00	36.74
22575	21967	16.92	37.60
23014	21967	3.60	37.61

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Dequalinium chloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20350-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dequalinium chloride; Dequalinii chloridum; Dequalinium chloratum

Special notes

When selecting the *Dequalinium chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dequalinium chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dequalinium chlo...	1166204	20350	40	AR-12-FG-007019-01
Caelo	Dequalinium chlo...	11166203	20475	40	AR-13-FG-000831-01
Fagron	Dequalinium chlo...	11D29-N11	20660	80	20110519
Fagron	Dequalinium chlo...	13I26-N10	21269	40	20130121
Caelo	Dequalinium chlo...	12361908	21296	40	1412076
Caelo	Dequalinium chlo...	12361906	21386	40	20121228

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dequalinium chlo...	12361906	21387	40	20121228
Euro OTC	Dequalinium chlo...	1405012-01	21617	40	20140623
Euro OTC	Dequalinium chlo...	1512032	22295	40	20160121*
Caelo	Dequalinium chlo...	15218406	22953	40	20150622

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 440 spectra of 10 reference samples from the substance/substance group *Dequalinium chloride*. These samples are listed above in the [calibration samples](#) section.
- 75 438 spectra from a total of 1567 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 505 spectra of 11 reference samples from the substance/substance group *Dequalinium chloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dequalinium chloride	9336412	20254	45
Caelo	Dequalinium chloride	12077503	20716	40
Caelo	Dequalinium chloride	12361906	21386 [†]	20
Caelo	Dequalinium chloride	12361906	21387 [†]	80
Euro OTC	Dequalinium chloride	1405012-01	21617 [†]	20
Euro OTC	Dequalinium chloride	1512032	22295 [†]	20
Caelo	Dequalinium chloride	12361906	21386SI	60
Caelo	Dequalinium chloride	12361906	21387SI	60
Euro OTC	Dequalinium chloride	1405012-01	21617SI	60
Euro OTC	Dequalinium chloride	1512032	22295SI	60
Caelo	Dequalinium chloride	15218406	22953SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 80 843 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 92 spectra from 61 *Apo-Ident* customers from 48 batches from the substance/substance group *Dequalinium chloride*.

Supplier	Substance	Batch	Spectra
Fagron	Dequalinium chloride	12B14-N01	1
Euro OTC	Dequalinium chloride	1210008-02	2
Euro OTC	Dequalinium chloride	1405012-02	2
Caelo	Dequalinium chloride	13A23-N02	1
Caelo	Dequalinium chloride	13348805	2
Euro OTC	Dequalinium chloride	1407029-02	2
Fagron	Dequalinium chloride	14C10-B03-292286	2
Caelo	Dequalinium chloride	215I-01325	1
Lamotte/Spangroh	Dequalinium chloride	15218404	1
Caelo	Dequalinium chloride	12077510	7
S.Binder	Dequalinium chloride	1210008-04	1
Euro OTC	Dequalinium chloride	121000803	1
Caelo	Dequalinium chloride	12361906	3
Caelo	Dequalinium chloride	12361908	3
Caelo	Dequalinium chloride	12361911	2
Caelo	Dequalinium chloride	13/26-N10	1
Fagron	Dequalinium chloride	13A23-N02	3
Euro OTC	Dequalinium chloride	1405012-01	4
Raben-Apotheke Mildenau	Dequalinium chloride	1405012-01	1
Caelo	Dequalinium chloride	1405012-02	1
Fagron	Dequalinium chloride	13I26-N10	1
Euro OTC	Dequalinium chloride	1407029-01	3
Fagron	Dequalinium chloride	1407029-01	1
Euro OTC	Dequalinium chloride	151203201	1
Caelo	Dequalinium chloride	15218401	2
Caelo	Dequalinium chloride	15218404	1
Caelo	Dequalinium chloride	15218407	1
Caelo	Dequalinium chloride	15218402	1
Caelo	Dequalinium chloride	15218406	1
Fagron	Dequalinium chloride	15B16-B04-304432	1
Caelo	Dequalinium chloride	3613A-01325	1
Caelo	Dequalinium chloride	5315I-01325	1
Fagron	Dequalinium chloride		1
Euro OTC	Dequalinium chloride	1010022-01	2
Euro OTC	Dequalinium chloride	1210008-01	2
Phönix	Dequalinium chloride	10127-N02Retest	1
Euro OTC	Dequalinium chloride	1110002-01	3
Fagron	Dequalinium chloride	10H05-N07	1
EuRho	Dequalinium chloride	1110002-01	1
Caelo	Dequalinium chloride	11166203	1
Anzag ek:7.89EUR	Dequalinium chloride	11166204	1
Caelo	Dequalinium chloride	11166204	2
Caelo	Dequalinium chloride	11166209	1
Caelo	Dequalinium chloride	12077508	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Alliance Health	Dequalinium chloride	12077508	1
AHD, 24.09.2013	Dequalinium chloride	12077508	1
Euro OTC	Dequalinium chloride	1210008-03	2
Noweda	Dequalinium chloride	12b14-n05	1
Fagron	Dequalinium chloride	12B14-N05	1
Caelo	Dequalinium chloride	12G05-N07	1
Fagron	Dequalinium chloride	12D05-N09	1
Fagron	Dequalinium chloride	12G05-N07	1
Fagron	Dequalinium chloride	13D26-N06	3
GEHE	Dequalinium chloride		1
Euro OTC	Dequalinium chloride	15061204	1
Caelo	Dequalinium chloride	220812K2	1
Euro OTC	Dequalinium chloride	1103045-01	1
Caelo	Dequalinium chloride		1

- 55 909 spectra from 335 *Apo-Ident* customers from a total of 20 563 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dequalinium chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dequalinium chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	440	0	75 438
Type B	0	478	27	80 843
Type C	0	83	9	55 909

The substance/substance group *Dequalinium chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6364 %)
Type B	100.0000 % (> 99.9853 %)	94.6535 % (> 94.0594 %)
Type C	100.0000 % (> 99.8622 %)	90.2174 % (> 86.9565 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20350	20350	0.00	49.94
20475	20475	0.00	48.72
20660	20350	16.57	57.55
21269	20350	17.34	45.94
21296	21296	0.00	41.42
21386	21296	36.63	55.68
21387	21296	9.38	43.07
21617	21296	10.07	44.78
22295	22295	0.00	45.65
22953	20350	18.61	43.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Dexamethasone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20009-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dexamethasone; Dexamethasonum

Special notes

When selecting the *Dexamethasone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dexamethasone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dexamethasone	81002179	20009	30	I 2009 000 272
Euro OTC	Dexamethasone	1303007-01	21289	40	1407432
Caelo	Dexamethasone	13084315	21403	40	AR-15-FG-006810-01
Euro OTC	Dexamethasone	1303007-01	21850	45	20130328
Euro OTC	Dexamethasone	1601052	22364	30	20160225*
Euro OTC	Dexamethasone	1611001	22914	40	20161212*
Euro OTC	Dexamethasone	1303007-01	21850SI	35	20130328
Euro OTC	Dexamethasone	1601052	22364SI	30	20160225*
Euro OTC	Dexamethasone	1611001	22914SI	37	20161212*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 327 spectra of 9 reference samples from the substance/substance group *Dexamethasone*. These samples are listed above in the [calibration samples](#) section.
- 75 551 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 8 reference samples from the substance/substance group *Dexamethasone*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Dexamethasone	1012005-01	20188	45
Caelo	Dexamethasone	13084306	21062	40
Euro OTC	Dexamethasone	1209008-02	21078	40
Caelo	Dexamethasone	13084315	21403 [†]	20
Euro OTC	Dexamethasone	1303007-01	21850 [†]	15
Euro OTC	Dexamethasone	1601052	22364 [†]	15
Euro OTC	Dexamethasone	1303007-01	21850SI [†]	10
Euro OTC	Dexamethasone	1601052	22364SI [†]	15

- 81 148 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

provided by the customer regarding manufacturer and batch number.

- 348 spectra from 150 *Apo-Ident* customers from 117 batches from the substance/substance group *Dexamethasone*.

Supplier	Substance	Batch	Spectra
Phoenix Goettin	Dexamethasone	117113352302	1
Euro OTC	Dexamethasone	10369920	2
Caelo	Dexamethasone		1
Caelo	Dexamethasone	10369921	2
Caelo	Dexamethasone	11D26-N10	1
Fagron	Dexamethasone	11L08-N01	4
Caelo	Dexamethasone	12033315	4
Caelo	Dexamethasone	12033301	4
Euro OTC	Dexamethasone	1209008-01	8
Euro OTC	Dexamethasone	1209008-02	24
Euro OTC	Dexamethasone	120900802	2
unbekannt	Dexamethasone	12D26-N09	1
Euro OTC	Dexamethasone	13030007	1
Euro OTC	Dexamethasone	1303007	1
Euro OTC	Dexamethasone	1303007-01	21
Raben-Apotheke Mildenau	Dexamethasone	1303007-01	2
Euro OTC	Dexamethasone	130300701	4
EuRho	Dexamethasone	1303007-01	1
Euro OTC	Dexamethasone	130300702	2
Euro OTC	Dexamethasone	1303007-02	3
GEHE 12.03.2014	Dexamethasone	13084306	1
Euro OTC	Dexamethasone	1303007-03	5
Caelo	Dexamethasone	13084307	3
Caelo	Dexamethasone	13084306	3
Fagron	Dexamethasone	13084308	1
Caelo	Dexamethasone	13084308	2
Caelo	Dexamethasone	13084309	1
Sanacorp	Dexamethasone	13084308	1
Caelo	Dexamethasone	13084310	6
Gehe 8.04.2014	Dexamethasone	13084310	2
Caelo	Dexamethasone	13084316	2
Phoenix	Dexamethasone	13084313	2
Caelo	Dexamethasone	13084313	2
Caelo	Dexamethasone	13084317	6
Gehe	Dexamethasone	13084317	1
Caelo	Dexamethasone	13084319	2
Caelo	Dexamethasone	13084320	3
Caelo	Dexamethasone	13352302	6
Caelo	Dexamethasone	13352304	1
Caelo	Dexamethasone	13352308	5
Berkel AHK	Dexamethasone	13352309	1
Caelo	Dexamethasone	13352309	1
Sanacorp	Dexamethasone	13352309	1
Caelo	Dexamethasone	13352310	4
Caelo	Dexamethasone	13352311	1
Caelo	Dexamethasone	13352312	7
Phönix Gotha	Dexamethasone	13352311	1
Fagron	Dexamethasone	13D12-N19	1
Fagron	Dexamethasone	13G08-N13	7
Phoenix	Dexamethasone	13g08n13	1
Caelo	Dexamethasone	14196402	2
Fagron	Dexamethasone	14A22-B03	1
Fagron	Dexamethasone	14A22-B03-294030	1
Fagron	Dexamethasone	14D11-B01-294032	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Dexamethasone	14D11-B01-294031	1
Caelo	Dexamethasone	15054602	6
Caelo	Dexamethasone	15054603	1
Caelo	Dexamethasone	15054605	2
Fagron	Dexamethasone	15054603	1
Caelo	Dexamethasone	15054606	6
Sanofi-Chimie FR/Noweda	Dexamethasone	15054606	2
Caelo	Dexamethasone	15054609	4
Caelo	Dexamethasone	15054611	3
Caelo	Dexamethasone	15054617	2
Caelo	Dexamethasone	15054621	1
Caelo	Dexamethasone	15054622	1
Fagron	Dexamethasone	15A05-B01-034636	1
Fagron	Dexamethasone	15A05-B01	1
Fagron	Dexamethasone	15a05-b01-304636	1
Fagron	Dexamethasone	15C16-B07	1
Fagron	Dexamethasone	15A05-B01-304636	1
Fagron	Dexamethasone	15C16-B07-308252	1
Caelo	Dexamethasone	15A05-B01-304637	1
Fagron	Dexamethasone	15I04-B04-315528	1
Phoenix	Dexamethasone	15I04-B04	1
Euro OTC	Dexamethasone	1601052-01	3
PHÖNIX	Dexamethasone	15K17-B07	1
Euro OTC	Dexamethasone	1601052-02	1
Euro OTC	Dexamethasone	DB003/0213	2
Fagron	Dexamethasone	2314A-01327	1
Fagron	Dexamethasone	9383631	1
Caelo	Dexamethasone	90939399	1
Fagron	Dexamethasone	7H21N03	1
Caelo	Dexamethasone	10369917	1
Phönix Gotha	Dexamethasone	9383629	1
Caelo	Dexamethasone	10369919	1
Phönix Gotha	Dexamethasone	10369919	1
ANZAG am 29.05.2012	Dexamethasone	10369920	1
Caelo	Dexamethasone	10369920	5
Gehe	Dexamethasone	10369920	1
Caesar & Loretz GmbH, 4...	Dexamethasone	10369922	1
Phoenix	Dexamethasone	10369928	1
Euro OTC	Dexamethasone	1107006-01	1
Euro OTC	Dexamethasone	110700601	1
Euro OTC	Dexamethasone	1111055-01	6
Noweda	Dexamethasone	1107006-02	1
Noweda	Dexamethasone	1111055-01	2
Euro OTC	Dexamethasone	111105501	1
Euro OTC	Dexamethasone	1111055-02	3
Fagron	Dexamethasone	11D26-N10	1
Fagron	Dexamethasone	11F30-N02	1
Euro OTC	Dexamethasone	12030320	1
Phönix	Dexamethasone	120303201	1
Anzag	Dexamethasone	1203032-01	1
Euro OTC	Dexamethasone	1203032-01	4
Fagron	Dexamethasone	1203032-02	1
Euro OTC	Dexamethasone	1203032-02	4
Caelo	Dexamethasone	12033304	1
Caelo	Dexamethasone	12033305	4
Anzag 18.06.2013	Dexamethasone	12033305	1
Phönix	Dexamethasone	12033306	1
Caelo	Dexamethasone	12033306	1
Caelo	Dexamethasone	12033307	5
Sanofi-Chimie, FR/ Noweda	Dexamethasone	12033308	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Dexamethasone	12033308	2
Caelo	Dexamethasone	12033314	6
Caelo	Dexamethasone	12033312	1
gehe 30.09.13	Dexamethasone	12033314	2
Phönix	Dexamethasone	12033314	1
Phönix Gotha	Dexamethasone	12033315	1
GEHE	Dexamethasone	12033317	1
Caelo	Dexamethasone	12033317	5
Caelo	Dexamethasone	12033318	5
Gehe	Dexamethasone	12033318	1
Euro OTC	Dexamethasone	1209006-02	1
Fagron	Dexamethasone	1209008-01	1
Euro OTC	Dexamethasone	1209008	1
Gehe	Dexamethasone	120900802	1
Caelo	Dexamethasone	12091306	1
Caelo	Dexamethasone	12165803	1
Caelo	Dexamethasone	12165804	2
Phönix 10.01.2013	Dexamethasone	12165803	1
Anzag	Dexamethasone	1233305	1
Fagron	Dexamethasone	12B06-N12	5
Fagron	Dexamethasone	12H21-N11	3
Fagron	Dexamethasone	12D26-N09	2
Caelo	Dexamethasone	13084304	2
Caelo	Dexamethasone	13084305	4
Caelo	Dexamethasone	13084314	1
Caelo	Dexamethasone	130854306	1
Gehe	Dexamethasone	13D12-N09	2
Caelo	Dexamethasone	13D12-N09	1
Fagron	Dexamethasone	13D12-N09	2
Euro OTC	Dexamethasone	2803211327	1
Euro OTC	Dexamethasone	1512211327	1
Euro OTC	Dexamethasone		1
Caelo	Dexamethasone	3084310	1
Euro OTC	Dexamethasone	5213A1327	1
Caelo	Dexamethasone	72134487	1
Caelo	Dexamethasone	DM-MIC10005K	1
Fagron	Dexamethasone	DZ11005K12B06-N12	1
Euro OTC	Dexamethasone	DZ11005K	1
Gehe	Dexamethasone	1203032-02	1

- 55 653 spectra from 335 *Apo-Ident* customers from a total of 20 494 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dexamethasone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dexamethasone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	327	0	75 551
Type B	0	200	0	81 148
Type C	0	347	1	55 653

The substance/substance group *Dexamethasone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.1651 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8622 %)	99.7126 % (> 98.8506 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20009	20009	0.00	9.33
21289	21289	0.00	23.59
21403	21403	0.00	11.80
21850	21289	8.57	23.20
22364	22364	0.00	9.62
22914	22914	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 1.3-2017-02

Validated substance/substance group **Dexamethasone acetate**
 Substance class APIs & excipients, solid
 Report date 12/04/2017
 Report number 20313-2017-04-12
 Executing company HiperScan GmbH
 Weißeritzstraße 3
 01067 Dresden
 Germany

Relevant substance names

Dexamethasone acetate; Dexamethasoni acetas; Dexamethasonum aceticum

Special notes

When selecting the *Dexamethasone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dexamethasone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dexamethasone ac...	11093210	20313	40	AR-12-FG-008544-01
Caelo	Dexamethasone ac...	13260703	21301	40	1412430
Caelo	Dexamethasone ac...	13260706	21593	40	1502537
Euro OTC	Dexamethasone ac...	1405024-01	21614	40	20140620
Caelo	Dexamethasone ac...	14200207	21815	40	20140807
Euro OTC	Dexamethasone ac...	1405024-01	21614SI	30	20140620
Caelo	Dexamethasone ac...	14200207	21815SI	30	20140807

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 260 spectra of 7 reference samples from the substance/substance group *Dexamethasone acetate*. These samples are listed above in the [calibration samples](#) section.
- 75 618 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 232 spectra of 8 reference samples from the substance/substance group *Dexamethasone acetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dexamethasone acetate	10145912	20325	40
Caelo	Dexamethasone acetate	13260706	21593 [†]	20
Euro OTC	Dexamethasone acetate	1405024-01	21614 [†]	20
Caelo	Dexamethasone acetate	14200207	21815 [†]	20
Caelo	Dexamethasone acetate	161066	22437	60
Euro OTC	Dexamethasone acetate	1405024-01	21614SI [†]	15
Caelo	Dexamethasone acetate	14200207	21815SI [†]	15
Caelo	Dexamethasone acetate	161066	22437SI	42

- 81 116 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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*.

- 73 spectra from 36 *Apo-Ident* customers from 38 batches from the substance/substance group *Dexamethasone acetate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Dexamethasone acetate	1110007-02	6
Euro OTC	Dexamethasone acetate	1110007-03	1
Caelo	Dexamethasone acetate	13100404	3
Caelo	Dexamethasone acetate	13100407	4
Caelo	Dexamethasone acetate	13260701	3
Caelo	Dexamethasone acetate	13260702	1
Caelo	Dexamethasone acetate	13100408	1
Caelo	Dexamethasone acetate	13260703	3
Caelo	Dexamethasone acetate	13260705	2
Euro OTC	Dexamethasone acetate	140502402	1
Euro OTC	Dexamethasone acetate	1405024-01	1
Euro OTC	Dexamethasone acetate	1405024-03	4
Euro OTC	Dexamethasone acetate	1405024-02	2
Caelo	Dexamethasone acetate	14200201	3
Caelo	Dexamethasone acetate	14200205	2
Caelo	Dexamethasone acetate	14379607	1
Caelo	Dexamethasone acetate	14200207	1
Caelo	Dexamethasone acetate	14379609	1
Caelo	Dexamethasone acetate	14379616	1
Caelo	Dexamethasone acetate	15243201	1
Caelo	Dexamethasone acetate	15243202	1
Caelo	Dexamethasone acetate	11093210	1
Caelo	Dexamethasone acetate	11093215	1
Caelo	Dexamethasone acetate	11093211	1
Fagron	Dexamethasone acetate	1110007-01	1
EuRho	Dexamethasone acetate	1110007-01	1
Caelo	Dexamethasone acetate	12021801	4
Caelo	Dexamethasone acetate	12021803	3
Caelo	Dexamethasone acetate	13100403	4
Caelo	Dexamethasone acetate	12021814	1
VDL	Dexamethasone acetate	12021803	1
Caelo	Dexamethasone acetate	13100401	1
GEHE	Dexamethasone acetate	12021805	1
Caelo	Dexamethasone acetate	13100406	1
Noweda	Dexamethasone acetate	13100406	1
Phönix	Dexamethasone acetate		1
Caelo	Dexamethasone acetate	3913Q-01326	1
Caelo	Dexamethasone acetate	22/AKD2	1
Caelo	Dexamethasone acetate	4113I-01326	1
Euro OTC	Dexamethasone acetate	1110007-01	1
Caelo	Dexamethasone acetate	5/AD1	1
Caelo	Dexamethasone acetate	12021811	1
europharma	Dexamethasone acetate	1110007-01	1

- 55 928 spectra from 335 *Apo-Ident* customers from a total of 20 574 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dexamethasone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this

purpose, all relevant spectra of the various substances were compared with *Dexamethasone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	260	0	75 618
Type B	0	177	55	81 116
Type C	0	73	0	55 928

The substance/substance group *Dexamethasone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.6923 %)
Type B	100.0000 % (> 99.9853 %)	76.2931 % (> 75.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 91.7808 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20313	20313	0.00	27.88
21301	21301	0.00	29.95
21593	21593	0.00	22.00
21614	21301	6.08	29.61
21815	21593	8.02	25.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Dextromethorphan hydrobromide monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22318-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dextromethorphan hydrobromide monohydrate; Dextromethorphan hydrobromidum

Special notes

When selecting the *Dextromethorphan hydrobromide monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dextromethorphan hydrobromide monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Dextromethorphan...	15D23-B07-308849	22318	40	AR-16-FG-008487-02
Fagron	Dextromethorphan...	15D23-B07-308849	22326	40	20150508

Validation samples

A total of 213 227 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 *Dextromethorphan - hydrobromide monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 52 spectra of 4 reference samples from the substance/substance group *Dextromethorphan - hydrobromide monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Dextromethorphan hydrobromid. ...	15D23-B07-308849	22318 [†]	20
Fagron	Dextromethorphan hydrobromid. ...	15D23-B07-308849	22326 [†]	20
Fagron	Dextromethorphan hydrobromid. ...	14H27-B04-299502	not required	7
Fagron	Dextromethorphan hydrobromid. ...	16A22-B03-321371	not required	5

- 81 296 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Dextromethorphan hydrobromide monohydrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Dextromethorphan hydrobromide monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dextromethorphan hydrobromide monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	52	0	81 296
Type C	0	0	0	56 001

The substance/substance group *Dextromethorphan hydrobromide monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 88.4615 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22318	22318	0.00	45.79
22326	22318	1.82	45.69

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **D-galactose**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20326-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

D-galactose; D-Galactopyranose; Galactosum

Special notes

When selecting the *D-galactose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *D-galactose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Kaden Biochem...	D-galactose	013	20326	40	AR-12-FG-007063-01
Hirundo	D-galactose	6878838-1209	20841	40	1401136
Falcento	D-galactose	007223PF3	20894	40	20130128
Fagron	D-galactose	13I13-B40-287993	21762	40	AR-15-FG-008936-01
Fagron	D-galactose	14H05-B09-310972	22259	40	20140818

Validation samples

A total of 213 227 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 D-galactose. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 110 spectra of 4 reference samples from the substance/substance group D-galactose.

Supplier	Substance	Batch	Sample ID	Spectra
inalc	D-galactose	372PF1	20259	30
Fagron	D-galactose	11F30-N08	20839	40
Fagron	D-galactose	13I13-B40-287993	21762 [†]	20
Fagron	D-galactose	14H05-B09-310972	22259 [†]	20

- 81 238 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 29 spectra from 4 *Apo-Ident* customers from 20 batches from the substance/substance group D-galactose.

Supplier	Substance	Batch	Spectra
Phönix	D-galactose	12223PF4	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
inalco	D-galactose	212619PF5	1
Falcento	D-galactose	1223PF4	3
Falcento	D-galactose	2223PF4	3
Falcento	D-galactose	122PF4	1
Falcento	D-galactose	5223PF4	3
Falcento	D-galactose	222PF4	1
Falcento	D-galactose	13223PF4	1
Falcento	D-galactose	2014	1
Phönix	D-galactose	39223PF3	2
Falcento	D-galactose	10440003	1
Falcento	D-galactose	48223PF2	1
Denk	D-galactose	10440003	1
falcento	D-galactose	322619PF5	1
Phönix 04.03.2014	D-galactose		1
Fagron	D-galactose	10E06-N01	1
Fagron	D-galactose	11L19-N07	1
Fagron	D-galactose	12B09-N02	1
Ruth	D-galactose	142185443	1
Denk	D-galactose		1
AppliChem	D-galactose	2K003859	1

- 55 972 spectra from 335 *Apo-Ident* customers from a total of 20 592 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *D-galactose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *D-galactose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	10	81 238
Type C	0	29	0	55 972

The substance/substance group *D-galactose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	90.9091 % (> 88.1818 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 79.3103 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20326	20326	0.00	50.50
20841	20841	0.00	53.68
20894	21762	10.62	51.61
21762	21762	0.00	50.61
22259	21762	4.56	51.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Diclofenac sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20022-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Diclofenac sodium; Diclofenacum natricum; Natrii diclofenaci

Special notes

When selecting the *Diclofenac sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Diclofenac sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Diclofenac sodium	80110508	20022	30	I 2009 000 267
Caelo	Diclofenac sodium	12214219	20883	29	20120815
Fagron	Diclofenac sodium	13E03-N02	20886	40	20130515
Fagron	Diclofenac sodium	12L28-B05	21261	40	20130123
Caelo	Diclofenac sodium	13214311	21467	40	20130826
Caelo	Diclofenac sodium	13214311	21470	40	20130826
Euro OTC	Diclofenac sodium	1607016	22694	40	20160808*
Caelo	Diclofenac sodium	163492	23037	40	20170112*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 299 spectra of 8 reference samples from the substance/substance group *Diclofenac sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 579 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Diclofenac sodium*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Diclofenac sodium	1403013-01	21330	40
Caelo	Diclofenac sodium	13214311	21467 [†]	20
Caelo	Diclofenac sodium	13214311	21470 [†]	20
Fagron	Diclofenac sodium	15D14-B04-307452	21979	60

- 81 208 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 107 spectra from 54 *Apo-Ident* customers from 50 batches from the substance/substance group *Diclofenac sodium*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Diclofenac sodium	5041401	1
Caelo	Diclofenac sodium	5081501	1
Fagron	Diclofenac sodium	10031505	1
Euro OTC	Diclofenac sodium	111104001	1
Euro OTC	Diclofenac sodium	11091404	1
Caelo	Diclofenac sodium	12214202	1
Euro OTC	Diclofenac sodium	12214220	1
Caelo	Diclofenac sodium	12L28-B05	1
Fagron	Diclofenac sodium	12L28-B05-289773	2
Caelo	Diclofenac sodium	13214308	3
Caelo	Diclofenac sodium	13214309	2
Caelo	Diclofenac sodium	13214304	1
Caelo	Diclofenac sodium	13214311	8
Fischar/Phönix	Diclofenac sodium	13214311	1
Caelo	Diclofenac sodium	13214317	4
Caelo	Diclofenac sodium	13214312	1
Caelo	Diclofenac sodium	13214318	4
Caelo	Diclofenac sodium	13H22-N10	1
Euro OTC	Diclofenac sodium	1403013-01	4
Euro OTC	Diclofenac sodium	1403013-02	5
Euro OTC	Diclofenac sodium	1403013-03	3
EurRho/ Anzag	Diclofenac sodium	1403013-03	1
Fagron	Diclofenac sodium	14031411	1
Fagron	Diclofenac sodium	14G17-B08-297032	5
Euro OTC	Diclofenac sodium	1503014-01	8
Caelo	Diclofenac sodium	1503014-01	1
Euro OTC	Diclofenac sodium	1503014-02	2
Caelo	Diclofenac sodium	15169604	4
Fagron	Diclofenac sodium	15D14-B04	1
AHD	Diclofenac sodium	15D14B04314450	1
Caelo	Diclofenac sodium	15169613	1
Fagron	Diclofenac sodium	15K23-B03	1
Phoenix	Diclofenac sodium	15K23-B03	1
Euro OTC	Diclofenac sodium	1607016-01	1
Fagron	Diclofenac sodium	15K23-B03-324025	1
Fagron	Diclofenac sodium	RDS/1405/0159A	1
Caelo	Diclofenac sodium	10335805	1
Euro OTC	Diclofenac sodium	1111040-01	1
Euro OTC	Diclofenac sodium	25041403	1
Caelo	Diclofenac sodium	11091201	1
Noweda	Diclofenac sodium	11301804	1
Noweda	Diclofenac sodium	11G12-N06	1
Euro OTC	Diclofenac sodium	1206026	1
Gehe	Diclofenac sodium	1206026-01	2
Euro OTC	Diclofenac sodium	1206026-01	6
Sanacorp	Diclofenac sodium	1206026-01	1
Euro OTC	Diclofenac sodium	1206026-02	5
Caelo	Diclofenac sodium	12214205	1
Caelo	Diclofenac sodium	12214219	1
Anzag Kassel 270812	Diclofenac sodium	12A10-N03	1
Caelo	Diclofenac sodium	12214206	1
Fagron	Diclofenac sodium	12G02-N07	1
Euro OTC	Diclofenac sodium	13111203	1
Europharm/Otto	Diclofenac sodium	135796	1
Fagron	Diclofenac sodium	13E03-N02	1
Caelo	Diclofenac sodium	13214303	1

- 55 894 spectra from 335 *Apo-Ident* customers from a total of 20 561 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Diclofenac sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diclofenac sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	299	0	75 579
Type B	0	140	0	81 208
Type C	0	107	0	55 894

The substance/substance group *Diclofenac sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.9933 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 94.3925 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20022	20022	0.00	57.44
20883	23037	5.93	53.76
20886	23037	7.34	54.73
21261	23037	6.60	55.77
21467	23037	5.49	53.88
21470	20022	7.51	57.76
22694	22694	0.00	49.95
23037	23037	0.00	54.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Diltiazem hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20043-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Diltiazem hydrochloride; Diltiazemi hydrochloridum; Diltiazemum hydrochloricum

Special notes

When selecting the *Diltiazem hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Diltiazem hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Diltiazem hydroc...	91400279	20043	30	I 2009 000 345
Fagron	Diltiazem hydroc...	14C12-B04	21270	40	20140417
Caelo	Diltiazem hydroc...	13346914	21300	40	20131028
Caelo	Diltiazem hydroc...	13346914	21406	40	20131028
Caelo	Diltiazem hydroc...	13346914	21407	40	20131028
Fagron	Diltiazem hydroc...	16G20-B03-328133	23016	40	20160829

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 6 reference samples from the substance/substance group *Diltiazem hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 648 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Diltiazem hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Diltiazem hydrochloride	13346914	21406 [†]	20
Caelo	Diltiazem hydrochloride	13346914	21407 [†]	20
Caelo	Diltiazem hydrochloride	161908	22631	40
Fagron	Diltiazem hydrochloride	16G20-B03-328133	23015	40

- 81 228 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 631 spectra from 193 *Apo-Ident* customers from 182 batches from the substance/substance group *Diltiazem hydrochloride*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	1091503	1
Caelo	Diltiazem hydrochloride	12133022	13
Fagron	Diltiazem hydrochloride	12D05-N07	15
Caelo	Diltiazem hydrochloride	10212421	1
Fagron	Diltiazem hydrochloride	12F19-N10	6
Caelo	Diltiazem hydrochloride	13031501	1
11.08.14 Phoenix	Diltiazem hydrochloride	13346901	1
Phönix	Diltiazem hydrochloride	13196104	1
Caelo	Diltiazem hydrochloride	13346901	7
Phönix	Diltiazem hydrochloride	13196106	1
Phoenix	Diltiazem hydrochloride	13346902	1
Caelo	Diltiazem hydrochloride	13346902	4
Caelo	Diltiazem hydrochloride	13346903	7
Caelo	Diltiazem hydrochloride	13346904	5
Caelo	Diltiazem hydrochloride	13346905	9
Caelo	Diltiazem hydrochloride	13346908	4
Caelo	Diltiazem hydrochloride	13346914	8
Caelo	Diltiazem hydrochloride	13346915	9
Fagron	Diltiazem hydrochloride	13346915	1
Fagron	Diltiazem hydrochloride	135968-0009	2
Fagron	Diltiazem hydrochloride	13G16-N05	22
Fagron	Diltiazem hydrochloride	1359680007	1
Caelo	Diltiazem hydrochloride	13G16-N05	2
Kuerzel	Diltiazem hydrochloride	13G16-N05	1
Fagron	Diltiazem hydrochloride	13J24-B04	4
Caelo	Diltiazem hydrochloride	13J24-B04-286569	1
Fagron	Diltiazem hydrochloride	13J24B04286569	3
Fagron	Diltiazem hydrochloride	13J24-B04-286569	4
Fagron	Diltiazem hydrochloride	13J24-B04-289432	3
Caelo	Diltiazem hydrochloride	1405904	1
Caelo	Diltiazem hydrochloride	14059502	2
Caelo	Diltiazem hydrochloride	14059513	12
Caelo	Diltiazem hydrochloride	14059133	1
Fagron	Diltiazem hydrochloride	13J24-B04-286571	2
Caelo	Diltiazem hydrochloride	14059503	1
Fagron	Diltiazem hydrochloride	14059504	2
Caelo	Diltiazem hydrochloride	14059514	11
Berkel AHK	Diltiazem hydrochloride	14059514	2
phönix	Diltiazem hydrochloride	14059514	1
Caelo	Diltiazem hydrochloride	14059515	1
Caelo	Diltiazem hydrochloride	14059521	2
Caelo	Diltiazem hydrochloride	140595143	1
Caelo	Diltiazem hydrochloride	14318402	4
Caelo	Diltiazem hydrochloride	14318403	4
Caelo	Diltiazem hydrochloride	14318409	9
Fagron	Diltiazem hydrochloride	14318409	1
Caelo	Diltiazem hydrochloride	14318410	2
Caelo	Diltiazem hydrochloride	14318412	12
Caesar&Loretz GmbH/Anzag	Diltiazem hydrochloride	14318412	1
phoenix	Diltiazem hydrochloride	14318412	1
Caelo	Diltiazem hydrochloride	14318413	3
Caelo	Diltiazem hydrochloride	14318414	2
Caelo	Diltiazem hydrochloride	1459513	1
Caelo	Diltiazem hydrochloride	14318416	2
Fagron	Diltiazem hydrochloride	14C12-B04	8
Fagron	Diltiazem hydrochloride	14C12B04	1
Fagron	Diltiazem hydrochloride	14C12-B04-292757	14
AHD	Diltiazem hydrochloride	14C12-B04-292757	1
Gehe	Diltiazem hydrochloride	14C12-B04-292757	1
Sanacorp	Diltiazem hydrochloride	14c12-b04-292757	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Diltiazem hydrochloride	14C12-B04-292759	3
Fagron	Diltiazem hydrochloride	14c12-b04-292759	1
Apomix/Noweda	Diltiazem hydrochloride	14C12-B04-292759	1
Caelo	Diltiazem hydrochloride	14C12-B04-294133	1
Fagron	Diltiazem hydrochloride	14C12-B04-294133	3
Fagron	Diltiazem hydrochloride	14C12-B04-294134	2
Caelo	Diltiazem hydrochloride	14C12-B04-294135	1
Fagron	Diltiazem hydrochloride	14G22-B08	4
Caelo	Diltiazem hydrochloride	14G22-B08-299781	1
Fagron	Diltiazem hydrochloride	14G22B08	1
Fagron	Diltiazem hydrochloride	14G22-B08-299781	5
Fagron	Diltiazem hydrochloride	14G22-B08299781	2
Fagron	Diltiazem hydrochloride	14G22-B08-299782	3
Caelo	Diltiazem hydrochloride	15212801	8
Fagron	Diltiazem hydrochloride	14G22-B08-299783	1
Caelo	Diltiazem hydrochloride	15/246/DI	1
Caelo	Diltiazem hydrochloride	15212802	4
Caelo	Diltiazem hydrochloride	15212806	2
Caelo	Diltiazem hydrochloride	1521806	1
Caelo	Diltiazem hydrochloride	15230501	3
Caelo	Diltiazem hydrochloride	15230000000000000000	1
Chiesi/Phoenix	Diltiazem hydrochloride	15230502	1
Caelo	Diltiazem hydrochloride	15230502	6
Caelo	Diltiazem hydrochloride	15230503	4
Phönix Gotha	Diltiazem hydrochloride	15230503	1
Caelo	Diltiazem hydrochloride	15230504	3
Noweda	Diltiazem hydrochloride	15230503	1
Phoenix	Diltiazem hydrochloride	15230503	1
Caelo	Diltiazem hydrochloride	15230507	4
Caelo	Diltiazem hydrochloride	15230512	2
Caelo	Diltiazem hydrochloride	15230514	2
Caelo	Diltiazem hydrochloride	15230510	1
Caelo	Diltiazem hydrochloride	15414301	8
Caelo	Diltiazem hydrochloride	15414302	7
Caesar&Loretz GmbH /Anzag	Diltiazem hydrochloride	15414302	1
Phönix	Diltiazem hydrochloride	15414302	1
Caelo	Diltiazem hydrochloride	15414305	1
Caesar & Loretz GmbH Hi...	Diltiazem hydrochloride	15414319	1
Caelo	Diltiazem hydrochloride	15414313	2
Jenne	Diltiazem hydrochloride	15414313	1
Gehe	Diltiazem hydrochloride	15414319	1
Caelo	Diltiazem hydrochloride	15414304	1
Caelo	Diltiazem hydrochloride	15414319	1
Fagron	Diltiazem hydrochloride	15B12-B01	5
Caelo	Diltiazem hydrochloride	15B12-B01-305399	1
Fagron	Diltiazem hydrochloride	15B12-B01-305399	4
Fagron	Diltiazem hydrochloride	15B12B01305399	1
Fagron	Diltiazem hydrochloride	15B12-B01-305400	2
Fagron	Diltiazem hydrochloride	15B12-B01-305401	1
Fagron	Diltiazem hydrochloride	15B12B01305400	1
Fagron	Diltiazem hydrochloride	15G20-B08-310792	1
Fagron	Diltiazem hydrochloride	15G20-B08	1
Caelo	Diltiazem hydrochloride	15G20-B08-312065	2
Fagron	Diltiazem hydrochloride	15G20-B08-314375	5
Fagron	Diltiazem hydrochloride	15G20-B08-312065	2
Caesar & Loretz	Diltiazem hydrochloride	16190806	1
Fagron	Diltiazem hydrochloride	16A18-B07	2
Fagron	Diltiazem hydrochloride	16A18B07316667	1
Fagron	Diltiazem hydrochloride	16A18-B07-316667	3
Fagron	Diltiazem hydrochloride	16A18-B07-318732	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	16A18-B07-318732	1
Fagron	Diltiazem hydrochloride	16C14-B11-320849	1
Fagron	Diltiazem hydrochloride	16C14-B11-322642	1
Caelo	Diltiazem hydrochloride	18061511	1
Caelo	Diltiazem hydrochloride	23121402	1
Fagron	Diltiazem hydrochloride	DIL/M-01314	1
Caelo	Diltiazem hydrochloride	25041401	1
Fagron	Diltiazem hydrochloride	DIL/M-10515	1
Fagron	Diltiazem hydrochloride	DIL/M-0314	1
Caelo	Diltiazem hydrochloride	6031302	1
Fagron	Diltiazem hydrochloride	DIL/M-13114	1
Fagron	Diltiazem hydrochloride	612213562	1
Fagron	Diltiazem hydrochloride	9J14-N17	2
Caelo	Diltiazem hydrochloride	10069509	1
Caelo	Diltiazem hydrochloride	10212404	3
Caelo	Diltiazem hydrochloride	10212413	1
Caelo	Diltiazem hydrochloride	10212411	1
Fagron	Diltiazem hydrochloride	10D28-N23	1
Fiebig ek:12.27 01.08.12	Diltiazem hydrochloride	11/01-N08	1
Fagron	Diltiazem hydrochloride	11/01-N08	1
Fagron	Diltiazem hydrochloride	10808-N01	1
phoenix	Diltiazem hydrochloride	11/01-N08	1
Caelo	Diltiazem hydrochloride	11091301	1
Fagron	Diltiazem hydrochloride	11-01-N08	1
Caelo	Diltiazem hydrochloride	11134103	1
Sanacorp	Diltiazem hydrochloride	11134115	4
Caelo	Diltiazem hydrochloride	11134107	1
Caelo	Diltiazem hydrochloride	11134113	1
Gehe	Diltiazem hydrochloride	11134117	1
Caelo	Diltiazem hydrochloride	11134117	8
Caelo	Diltiazem hydrochloride	11134119	1
Fiebig 10.09.12 ek: 13,...	Diltiazem hydrochloride	11134119	1
Sanacorp	Diltiazem hydrochloride	11134121	2
Phönix 13.11.12	Diltiazem hydrochloride	11A17-N13	1
Fagron	Diltiazem hydrochloride	11E18-N04	2
Fagron	Diltiazem hydrochloride	11I01-N08	2
Sanacorp	Diltiazem hydrochloride	11J28-04511	1
Fagron	Diltiazem hydrochloride	11J28-N05	3
Fagron	Diltiazem hydrochloride	11I012-N08	1
Caelo	Diltiazem hydrochloride	11L20-N06	1
Fagron	Diltiazem hydrochloride	11L20-N06	1
Fagron	Diltiazem hydrochloride	12/12-N02	3
Piramal Healthcare Ltd...	Diltiazem hydrochloride	12/12-N02	1
Gehe	Diltiazem hydrochloride	12/12-N02	1
Caelo	Diltiazem hydrochloride	12/12-N02	1
Gehe	Diltiazem hydrochloride	12133009	1
Sanacorp	Diltiazem hydrochloride	12/12-N02	2
Caelo	Diltiazem hydrochloride	12133008	2
Caelo	Diltiazem hydrochloride	12133006	1
Alliance	Diltiazem hydrochloride	12133008	1
Caelo	Diltiazem hydrochloride	12133009	7
Caelo	Diltiazem hydrochloride	12133010	16
Kehr	Diltiazem hydrochloride	12133010	1
Alliance	Diltiazem hydrochloride	12133009	1
Noweda	Diltiazem hydrochloride	12133010	1
Caesar & Loretz GmbH	Diltiazem hydrochloride	12133010	1
Gehe	Diltiazem hydrochloride	12133010	1
Caelo	Diltiazem hydrochloride	12133011	4
Caelo	Diltiazem hydrochloride	12133014	1
Noweda	Diltiazem hydrochloride	12133022	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Diltiazem hydrochloride	12133022	1
Caelo	Diltiazem hydrochloride	12133023	2
Caelo	Diltiazem hydrochloride	12133028	4
Caelo	Diltiazem hydrochloride	12133029	3
Noweda	Diltiazem hydrochloride	12133029	1
Caelo	Diltiazem hydrochloride	12176801	2
Caelo	Diltiazem hydrochloride	12133032	1
Noweda	Diltiazem hydrochloride	12176801	1
Anzag, 03.11.2012	Diltiazem hydrochloride	12176801	1
Phönix	Diltiazem hydrochloride	12176801	1
Caelo	Diltiazem hydrochloride	12176804	1
Caelo	Diltiazem hydrochloride	12177101	14
Fagron	Diltiazem hydrochloride	12d05-n07	2
Fagron	Diltiazem hydrochloride	12D05-n07	1
Noweda	Diltiazem hydrochloride	12D05-N07	1
Phönix, 28.03.2013	Diltiazem hydrochloride	12D05-N07	1
Fagron	Diltiazem hydrochloride	12D05-N070	1
Fagron	Diltiazem hydrochloride	12F19-N100102/574	1
Gehe	Diltiazem hydrochloride	12F19-N10	1
Piramal Healthcare LTD.	Diltiazem hydrochloride	12F19-N10	1
Fagron	Diltiazem hydrochloride	12I12-N02	2
Alliance Healthcare	Diltiazem hydrochloride	12I12-N02	1
Fagron	Diltiazem hydrochloride	12K07-N02	2
Caelo	Diltiazem hydrochloride	1319604	1
Fagron	Diltiazem hydrochloride	12I12-N02	1
Caelo	Diltiazem hydrochloride	13196103	3
Caelo	Diltiazem hydrochloride	13196104	8
Caelo	Diltiazem hydrochloride	13196105	19
Caelo	Diltiazem hydrochloride	13196107	3
Caelo	Diltiazem hydrochloride	1334609	1
Noweda	Diltiazem hydrochloride	13346901	1
Phoenix	Diltiazem hydrochloride	13346914	1
Fagron	Diltiazem hydrochloride	13a02-n05	1
Fagron	Diltiazem hydrochloride	13A02N05	3
Alliance Health	Diltiazem hydrochloride	13A02-N05	1
Fagron	Diltiazem hydrochloride	13A02-N05	5
AHD, 26.08.13	Diltiazem hydrochloride	13A02-N05	1
Caelo	Diltiazem hydrochloride	13A02-N05	2
Fagron	Diltiazem hydrochloride	13F13-N05	10
Phönix	Diltiazem hydrochloride	13F13-N05	1
Bombastus	Diltiazem hydrochloride	13F13-N05	1
Fagron	Diltiazem hydrochloride	13G16-N005	1
Caelo	Diltiazem hydrochloride	13G16-No5	1
Sanacorp	Diltiazem hydrochloride	13j24-b04-286569	1
Fagron	Diltiazem hydrochloride	13J24-B04-286570	1
Caelo	Diltiazem hydrochloride	13j24-b04-286571	1
Caelo	Diltiazem hydrochloride	15414309	1
Fagron	Diltiazem hydrochloride	15B12-B01-305299	1
Fagron	Diltiazem hydrochloride	15b12-b01-305399	1
Caelo	Diltiazem hydrochloride	20160812-1	1
Caelo	Diltiazem hydrochloride	2310213562	1
Caelo	Diltiazem hydrochloride		1
Fagron	Diltiazem hydrochloride	3713M-03562	1
Caelo	Diltiazem hydrochloride	3313U-03562	1
Caelo	Diltiazem hydrochloride	2704213562	1
Herbasinica	Diltiazem hydrochloride		1
Caelo	Diltiazem hydrochloride	13196106	3
Caelo	Diltiazem hydrochloride	DIL/M-04511	1
Caelo	Diltiazem hydrochloride	DIL/M-19911	1
Fagron	Diltiazem hydrochloride	15b12-b01-305400	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Diltiazem hydrochloride	16190807	1
Caelo	Diltiazem hydrochloride	16190806	1
Caelo	Diltiazem hydrochloride	11134121	1
Caelo	Diltiazem hydrochloride	1233011	1
Caelo	Diltiazem hydrochloride	12D05-N07	1
Fagron	Diltiazem hydrochloride	14c12-b04-294134	1
Fagron	Diltiazem hydrochloride	14C12-B04-294135	1
Caelo	Diltiazem hydrochloride	11134115	1
Caelo	Diltiazem hydrochloride	11134101	1
Fagron	Diltiazem hydrochloride	12/12-N02	1
Sanacorp	Diltiazem hydrochloride	12I12-N02	1
Caelo	Diltiazem hydrochloride	1396103	1

- 55 370 spectra from 335 *Apo-Ident* customers from a total of 20 432 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Diltiazem hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diltiazem hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	230	0	75 648
Type B	0	120	0	81 228
Type C	0	631	0	55 370

The substance/substance group *Diltiazem hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.3913 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 99.0491 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20043	20043	0.00	45.95
21270	20043	9.25	51.52
21300	20043	8.09	45.27
21406	20043	13.99	41.13
21407	20043	12.88	41.39
23016	20043	14.67	50.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Dimethyl fumarate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21558-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Dimethyl fumarate

Special notes

When selecting the *Dimethyl fumarate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Dimethyl fumarate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Dimethyl fumarate	13269801	21558	40	1506634
Euro OTC	Dimethyl fumarate	1410013-01	21833	40	20141125

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Dimethyl fumarate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Dimethyl fumarate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Dimethyl fumarate	13269801	21558 [†]	20
Euro OTC	Dimethyl fumarate	1410013-01	21833 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Dimethyl fumarate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Dimethyl fumarate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Dimethyl fumarate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Dimethyl fumarate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21558	21558	0.00	103.54
21833	21558	6.05	77.34

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Diphenhydramine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20186-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Diphenhydramine hydrochloride; Diphenhydramini hydrochloridum; Diphenhydraminum hydrochloricum

Special notes

When selecting the *Diphenhydramine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Diphenhydramine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Diphenhydramine ...	82811299	20186	40	AR-12-FG-002704-01
Caelo	Diphenhydramine ...	12329816	21304	40	20121119
Caelo	Diphenhydramine ...	12329816	21464	30	20121119

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Diphenhydramine - hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75768 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Diphenhydramine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Diphenhydramine hydrochloride	82811299	20186 [†]	10
Caelo	Diphenhydramine hydrochloride	82811179	20321	40
Caelo	Diphenhydramine hydrochloride	12329816	21464 [†]	30

- 81268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 47 spectra from 27 *Apo-Ident* customers from 32 batches from the substance/substance group *Diphenhydramine hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Diphenhydramine hydrochloride	2041403	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
PHOENIX 29.01.2013	Diphenhydramine hydrochloride	120208	1
Caelo	Diphenhydramine hydrochloride	12329815	1
Caelo	Diphenhydramine hydrochloride	13100462	1
Caelo	Diphenhydramine hydrochloride	13331810	1
Caelo	Diphenhydramine hydrochloride	13331813	1
Caelo	Diphenhydramine hydrochloride	13343104	1
Caelo	Diphenhydramine hydrochloride	15072602	2
Caelo	Diphenhydramine hydrochloride	15220402	1
Noweda	Diphenhydramine hydrochloride	15220402	1
Caelo	Diphenhydramine hydrochloride	15072603	1
Caelo	Diphenhydramine hydrochloride	15220403	1
Caelo	Diphenhydramine hydrochloride	15220404	3
Caelo	Diphenhydramine hydrochloride	15220405	1
Caelo	Diphenhydramine hydrochloride	1912I-01339	1
Caelo	Diphenhydramine hydrochloride	1814A-01339	1
Caelo	Diphenhydramine hydrochloride	20071502	1
Caelo	Diphenhydramine hydrochloride	2215I-01339	1
Caelo	Diphenhydramine hydrochloride	4061205	1
Caelo	Diphenhydramine hydrochloride	31031508	1
Caelo	Diphenhydramine hydrochloride	5121204	1
Fagron	Diphenhydramine hydrochloride	9F05-N04	3
Caelo	Diphenhydramine hydrochloride	10122030	4
Caelo	Diphenhydramine hydrochloride	12007702	1
Caelo	Diphenhydramine hydrochloride	12007715	2
Caesar/Noweda	Diphenhydramine hydrochloride	12007714	1
Caelo	Diphenhydramine hydrochloride	12007716	1
Noweda	Diphenhydramine hydrochloride	12007716	1
Caelo	Diphenhydramine hydrochloride	12007721	3
Sanacorp	Diphenhydramine hydrochloride	12329805	1
Phoenix, 18.09.2012	Diphenhydramine hydrochloride	12F28-N01	1
Fagron	Diphenhydramine hydrochloride	12F28-N01	1
Fagron	Diphenhydramine hydrochloride	13A14-B40	1
Anzag 16.03.2013	Diphenhydramine hydrochloride	12J04-N02	1
Fagron	Diphenhydramine hydrochloride	12J04-N02	1
Caelo	Diphenhydramine hydrochloride	25071306	1

- 55 954 spectra from 335 *Apo-Ident* customers from a total of 20 580 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Diphenhydramine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diphenhydramine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	80	0	81 268
Type C	0	47	0	55 954

The substance/substance group *Diphenhydramine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 87.2340 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20186	20186	0.00	45.38
21304	20186	8.38	40.91
21464	20186	8.28	44.68

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Diphenylcyclopropenone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20934-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Diphenylcyclopropenone; Diphenylcyclopropenonum

Special notes

When selecting the *Diphenylcyclopropenone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Diphenylcyclopropenone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Diphenylcyclopro...	12L17-N07	20934	40	1407599
Fagron	Diphenylcyclopro...	13I26-N12	21342	40	1504598
Fagron	Diphenylcyclopro...	13I26-N12	21539	30	20130920
Fagron	Diphenylcyclopro...	15J12-B01-316620	22362	40	9341

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Diphenylcyclopropanone*. These samples are listed above in the [calibration samples](#) section.
- 75 728 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 27 spectra of 3 reference samples from the substance/substance group *Diphenylcyclopropanone*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Diphenylcyclopropanone	13I26-N12	21539 [†]	5
Fagron	Diphenylcyclopropanone	15J12-B01-316620	22362 [†]	20
Fagron	Diphenylcyclopropanone	16F02-B10-327812	not required	2

- 81 321 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Diphenylcyclopropanone*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Diphenylcyclopropenone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Diphenylcyclopropenone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	75 728
Type B	0	27	0	81 321
Type C	0	0	0	56 001

The substance/substance group *Diphenylcyclopropenone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 77.7778 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20934	20934	0.00	30.31
21342	21342	0.00	77.73
21539	21342	2.63	77.49
22362	22362	0.00	26.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Doxycycline hyclate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20796-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Doxycycline hyclate; Doxycyclini hyclas; Doxycyclinum hemiaethanolicum hemihydricum

Special notes

When selecting the *Doxycycline hyclate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Doxycycline hyclate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Doxycycline hycl...	12G12-N15	20796	40	1404233
Fagron	Doxycycline hycl...	12G12-N15	20821	40	20120807
Fagron	Doxycycline hycl...	14K28-B05-312218	22242	40	20150216

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Doxycycline hyclate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Doxycycline hyclate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Doxycycline hyclate	14K28-B05-312218	22242 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Doxycycline hyclate*.

Supplier	Substance	Batch	Spectra
Fagron	Doxycycline hyclate	12G12-N15	1
Löwen City-Apotheke Bar...	Doxycycline hyclate	2042015	1
Löwen City-Apotheke Bar...	Doxycycline hyclate	10022014	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*.

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Doxycycline hyclate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Doxycycline hyclate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	20	0	81 328
Type C	0	3	0	55 998

The substance/substance group *Doxycycline hyclate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20796	20796	0.00	32.75
20821	20796	1.98	32.29
22242	20796	10.60	33.02

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Doxylamine hydrogen succinate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20315-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Doxylamine hydrogen succinate; Doxylamini hydrogenosuccinas; Doxylaminum succinicum

Special notes

When selecting the *Doxylamine hydrogen succinate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Doxylamine hydrogen succinate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Doxylamine hydro...	700296	20315	40	AR-12-FG-010234-01
Fagron	Doxylamine hydro...	14F03-B01-293498	21542	40	1410524
Fagron	Doxylamine hydro...	15F01-B04-309189	22601	40	AR-16-FG-011361-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Doxylamine hydrogen succinate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Doxylamine hydrogen succinate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Doxylamine hydrogen succinate	14F03-B01-293498	21542 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 32 spectra from 8 *Apo-Ident* customers from 12 batches from the substance/substance group *Doxylamine hydrogen succinate*.

Supplier	Substance	Batch	Spectra
Fagron	Doxylamine hydrogen succinate	12E29-N03	1
Fagron	Doxylamine hydrogen succinate	12E04-N04	4
Fagron	Doxylamine hydrogen succinate	14F03-B01-296846	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
Fagron	Doxylamine hydrogen succinate	12G10-N03	6
Caesar & Loretz GmbH, 4...	Doxylamine hydrogen succinate	13A04-N02	4
Fagron	Doxylamine hydrogen succinate	13E29-N03	4
Fagron	Doxylamine hydrogen succinate	483875887	1
Fagron	Doxylamine hydrogen succinate	14F03B01293498	1
Fagron	Doxylamine hydrogen succinate	11G20-N10	1
Fagron	Doxylamine hydrogen succinate	13/26-N14	1
Fagron	Doxylamine hydrogen succinate	11K17-N04	3
Fagron	Doxylamine hydrogen succinate	12K21-N01	3
Fagron	Doxylamine hydrogen succinate	13A04-N02	2

- 55 969 spectra from 335 *Apo-Ident* customers from a total of 20 600 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Doxylamine hydrogen succinate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Doxylamine hydrogen succinate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	20	0	81 328
Type C	0	25	7	55 969

The substance/substance group *Doxylamine hydrogen succinate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8622 %)	78.1250 % (> 68.7500 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20315	20315	0.00	33.17
21542	21542	0.00	31.45
22601	22601	0.00	34.78

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Drofenine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20320-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Drofenine hydrochloride; Drofenini hydrochloridum; Drofeninum hydrochloricum

Special notes

When selecting the *Drofenine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Drofenine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Drofenine hydroc...	10K29	20320	40	AR-12-FG-009284-01
Fagron	Drofenine hydroc...	13I09-N05	21275	40	20130524

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Drofenine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Drofenine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Drofenine hydrochloride	15G01-B04-323028	22807	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Drofenine hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Drofenine hydrochloride	11J24-N01	1
Fagron	Drofenine hydrochloride	12D04-N03	1

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Drofenine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Drofenine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	2	0	55 999

The substance/substance group *Drofenine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20320	20320	0.00	31.06
21275	20320	13.54	31.84

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Econazole nitrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20849-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Econazole nitrate; Econazoli nitras; Econazolum nitricum

Special notes

When selecting the *Econazole nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Econazole nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Econazole nitrate	12H08-N02	20849	40	1312442
Fagron	Econazole nitrate	11F09-N16	21268	40	20110606
Fagron	Econazole nitrate	12I06-B40-306925	22392	40	AR-16-FG-011359-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Econazole nitrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Econazole nitrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Econazole nitrate	12I06-B40-306925	22392SI	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Econazole nitrate*.

Supplier	Substance	Batch	Spectra
Fagron	Econazole nitrate	12I06-B40-289953	2
Fagron	Econazole nitrate	13D22-N06	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Econazole nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Econazole nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	18	22	81 308
Type C	0	2	1	55 998

The substance/substance group *Econazole nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	45.0000 % (> 37.5000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20849	20849	0.00	32.89
21268	20849	12.19	37.89
22392	22392	0.00	29.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Eosin yellowish**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20571-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Eosin yellowish; Eosinum natricum

Special notes

When selecting the *Eosin yellowish* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Eosin yellowish*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Eosin yellowish	12A02-N09	20571	39	1405095
Fagron	Eosin yellowish	12E25-N01	20900	55	20120607
Fagron	Eosin yellowish	13I11-N03	20932	40	20130925
Fagron	Eosin yellowish	13I11-N03	21208	40	20130925
Fagron	Eosin yellowish	15G01-T03-025958	22261	40	1604114
Fagron	Eosin yellowish	13F14-T01-017395	22534	40	1608469
Fagron	Eosin yellowish	13F14-T01-017395	22660	40	20141219

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 294 spectra of 7 reference samples from the substance/substance group *Eosin yellowish*. These samples are listed above in the [calibration samples](#) section.
- 75 584 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 106 spectra of 5 reference samples from the substance/substance group *Eosin yellowish*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Eosin yellowish	12A02-N09	20571 [†]	1
Fagron	Eosin yellowish	12E25-N01	20900 [†]	5
Fagron	Eosin yellowish	15G01-T03-025958	22261 [†]	20
Fagron	Eosin yellowish	13F14-T01-017395	22535	40
Fagron	Eosin yellowish	13F14-T01-017395	22816	40

- 81 242 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 33 spectra from 28 *Apo-Ident* customers from 17 batches from the substance/substance group *Eosin yellowish*.

[†]These spectra were recorded from 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
Fargon	Eosin yellowish	13/11-N03	3
Caelo	Eosin yellowish	13F14-T01-017395	1
Caelo	Eosin yellowish	14H28-M05	1
Caelo	Eosin yellowish	13I11-N03	1
Gehe	Eosin yellowish	14H28-M05	1
Fargon	Eosin yellowish	14H28-M09	1
Fargon	Eosin yellowish	14H28-M05	1
Fargon	Eosin yellowish	15G01T03025959	1
Fargon	Eosin yellowish	12E25-N01	4
Fargon	Eosin yellowish	11E25-N01	1
Caelo	Eosin yellowish	12e25-n01	1
Fargon	Eosin yellowish	EYWS/15/13	1
Sanacorp	Eosin yellowish	12E25-N01	1
Fargon	Eosin yellowish	12A02-N09	1
Fargon	Eosin yellowish	11F21-N10	1
Fargon	Eosin yellowish	12H28-N08	3
Fargon/Sanacorp	Eosin yellowish	13/11-No3	1
Fargon	Eosin yellowish	EYWS/16/11	2
Fargon	Eosin yellowish	2512A-01357	1
Fargon	Eosin yellowish	13/11-N03	1
Fargon	Eosin yellowish	13F14-T01-017395	3
Fargon	Eosin yellowish	14H28-M09	2

- 55 968 spectra from 335 *Apo-Ident* customers from a total of 20 594 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Eosin yellowish* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Eosin yellowish* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	289	5	75 584
Type B	0	105	1	81 242
Type C	0	18	15	55 968

The substance/substance group *Eosin yellowish* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	98.2993 % (> 97.2789 %)
Type B	100.0000 % (> 99.9853 %)	99.0566 % (> 96.2264 %)
Type C	100.0000 % (> 99.8622 %)	54.5455 % (> 45.4545 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20571	20571	0.00	84.35
20900	22261	24.01	88.16
20932	20571	17.83	78.12
21208	20571	15.88	76.08
22261	22261	0.00	65.14
22534	22534	0.00	65.02
22660	20571	12.64	84.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ephedrine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20993-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ephedrine hydrochloride; Ephedrini hydrochloridum; Ephedrinum hydrochloricum

Special notes

When selecting the *Ephedrine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ephedrine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ephedrine hydroc...	12017217	20993	40	1511635
Caelo	Ephedrine hydroc...	13323305	21322	40	20131113
Caelo	Ephedrine hydroc...	14378502	21803	40	20150106
Caelo	Ephedrine hydroc...	161197	22436	40	20160420*

Validation samples

A total of 213 227 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 *Ephedrine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Ephedrine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ephedrine hydrochloride	10103408	20228	40
Caelo	Ephedrine hydrochloride	14378502	21803 [†]	20
Caelo	Ephedrine hydrochloride	161197	22436 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 38 spectra from 17 *Apo-Ident* customers from 30 batches from the substance/substance group *Ephedrine hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
GATT-KOLLER/PHOENIX	Ephedrine hydrochloride	915/03141314	2
Phoenix 04.03.14	Ephedrine hydrochloride	1332303	1
Caelo	Ephedrine hydrochloride	13323302	1
Gehe am 04.03.14	Ephedrine hydrochloride	13323303	1
PHOENIX 10.03.2014	Ephedrine hydrochloride	13323302	1
Caelo	Ephedrine hydrochloride	13323305	2
Caelo	Ephedrine hydrochloride	13323309	1
Caelo	Ephedrine hydrochloride	13323310	1
Phönix	Ephedrine hydrochloride	13323315	1
Fagron	Ephedrine hydrochloride	13L30-B36	1
Caelo	Ephedrine hydrochloride	13323316	1
Caelo	Ephedrine hydrochloride	14378502	1
Caelo	Ephedrine hydrochloride	14378506	2
Caelo	Ephedrine hydrochloride	14378507	1
Caelo	Ephedrine hydrochloride	14378510	2
Caelo	Ephedrine hydrochloride	16119703	1
Gatt-Koller / Phoenix	Ephedrine hydrochloride	18502141114	1
Caelo	Ephedrine hydrochloride	11126407	1
Caelo	Ephedrine hydrochloride	10103425	1
Caesar & Loretz GmbH, 4...	Ephedrine hydrochloride	11126411	1
Anzag, 24.10.2012	Ephedrine hydrochloride	12017205	2
Caelo	Ephedrine hydrochloride	11126414	1
Phönix 01.12.12	Ephedrine hydrochloride	12017207	1
Caelo	Ephedrine hydrochloride	12017209	2
Caelo	Ephedrine hydrochloride	12017215	1
Caelo	Ephedrine hydrochloride	12017217	1
Fagron	Ephedrine hydrochloride	12017220	1
Caelo	Ephedrine hydrochloride	12017223	1
Caelo	Ephedrine hydrochloride	EphedrinHCL1	1
Phönix 05.11.2013	Ephedrine hydrochloride	12017223	1
Fagron	Ephedrine hydrochloride	13B19-N04	1
Caelo	Ephedrine hydrochloride	EphedrinHCL2	1

- 55 963 spectra from 335 *Apo-Ident* customers from a total of 20 581 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ephedrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ephedrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	80	0	81 268
Type C	0	38	0	55 963

The substance/substance group *Ephedrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 84.2105 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20993	20993	0.00	56.09
21322	20993	5.27	53.16
21803	20993	1.68	55.76
22436	22436	0.00	59.02

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Epinephrine hydrogen tartrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20689-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Epinephrine hydrogen tartrate; Adrenalin tartras; Adrenalinum bitartaricum

Special notes

When selecting the *Epinephrine hydrogen tartrate* substance/substance group, the following information is displayed to the user:

- Advice for the identification of epinephrine bitartrate: According to the BfArM, ephedrine and its salts are considered as critical drugs in compliance to § 5 AMG. Critical drugs must not be placed on the market or be applied to humans.

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Epinephrine hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Epinephrine hydr...	12120202	20689	40	1405614
Fagron	Epinephrine hydr...	12L22-N04	20749	40	20120106
Caelo	Epinephrine hydr...	12337804	21058	40	20121128
Caelo	Epinephrine hydr...	14007802	21489	40	1603180

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Epinephrine hydr...	14007802	21490	40	20140130
Caelo	Epinephrine hydr...	14007802	21494	40	20140130
Caelo	Epinephrine hydr...	14007802	21489SI	40	1603180
Caelo	Epinephrine hydr...	14007802	21490SI	40	20140130

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Epinephrine hydrogen tartrate*. These samples are listed above in the [calibration samples](#) section.
- 75 558 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 500 spectra of 22 reference samples from the substance/substance group *Epinephrine hydrogen tartrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Epinephrine hydrogen tartrate	12337805	21059	40
Caelo	Epinephrine hydrogen tartrate	14007802	21489 [†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21490 [†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21491	20
Caelo	Epinephrine hydrogen tartrate	14007802	21492	20
Caelo	Epinephrine hydrogen tartrate	14007802	21493	20
Caelo	Epinephrine hydrogen tartrate	14007802	21494 [†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21495	20
Caelo	Epinephrine hydrogen tartrate	14007802	21496	20
Caelo	Epinephrine hydrogen tartrate	14007802	21497	20
Caelo	Epinephrine hydrogen tartrate	14007802	21498	20
Caelo	Epinephrine hydrogen tartrate	162764	22777	40
Caelo	Epinephrine hydrogen tartrate	14007802	21489SI [†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21490SI [†]	20
Caelo	Epinephrine hydrogen tartrate	14007802	21491SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21492SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21493SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21495SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21496SI	20

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Epinephrine hydrogen tartrate	14007802	21497SI	20
Caelo	Epinephrine hydrogen tartrate	14007802	21498SI	20
Caelo	Epinephrine hydrogen tartrate	162764	22777SI	40

- 80 848 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 22 spectra from 11 *Apo-Ident* customers from 19 batches from the substance/substance group *Epinephrine hydrogen tartrate*.

Supplier	Substance	Batch	Spectra
Fagron	Epinephrine hydrogen tartrate	12G11-N07	1
Fagron	Epinephrine hydrogen tartrate	11L22-N04	1
Caelo	Epinephrine hydrogen tartrate	12120202	1
Phoenix 22.5.14	Epinephrine hydrogen tartrate	12337804	1
Caelo	Epinephrine hydrogen tartrate	15239703	1
Alliance Health 12.03.14	Epinephrine hydrogen tartrate	12337805	1
Fagron	Epinephrine hydrogen tartrate	15A13-B02-305559	2
Fagron	Epinephrine hydrogen tartrate	14E12-B02	1
Fargon GmbH & CoKG	Epinephrine hydrogen tartrate	16E09-B11-319882	2
Fagron	Epinephrine hydrogen tartrate	12/02-N03	1
Caelo	Epinephrine hydrogen tartrate	123337805	1
Caelo	Epinephrine hydrogen tartrate	12337805	1
Fagron	Epinephrine hydrogen tartrate	12G11-No70076/130	1
Caelo	Epinephrine hydrogen tartrate	12337801	1
Fagron	Epinephrine hydrogen tartrate	13I04-N03	1
Caelo	Epinephrine hydrogen tartrate	210316-3	1
Fagron	Epinephrine hydrogen tartrate	13I04-N03	1
Caelo	Epinephrine hydrogen tartrate	15239701	1
Caelo	Epinephrine hydrogen tartrate	10237109	1
Caelo	Epinephrine hydrogen tartrate	210316-1	1

- 55 979 spectra from 335 *Apo-Ident* customers from a total of 20 592 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Epinephrine hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Epinephrine hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	75 558
Type B	0	500	0	80 848
Type C	0	22	0	55 979

The substance/substance group *Epinephrine hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.8000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 72.7273 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20689	20689	0.00	51.25
20749	21489	13.52	50.84
21058	20689	6.32	50.78
21489	21489	0.00	51.67
21490	21489	15.44	52.54
21494	21489	1.68	51.43

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ergotamine tartrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21341-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ergotamine tartrate; Ergotamini tartras; Ergotaminum tartricum

Special notes

When selecting the *Ergotamine tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ergotamine tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ergotamine tartr...	15B16-B05-308418	22361	30	9384
Fagron	Ergotamine tartr...	15B16-B05-308417	22722	40	20150302
Fagron	Ergotamine tartr...	15B16-B05-308418	22361SI	30	9384
Fagron	Ergotamine tartr...	15B16-B05-308417	22722SI	40	20150302

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 140 spectra of 4 reference samples from the substance/substance group *Ergotamine tartrate*. These samples are listed above in the [calibration samples](#) section.
- 75 738 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 236 spectra of 5 reference samples from the substance/substance group *Ergotamine tartrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ergotamine tartrate	13H02-N01	21341	100
Fagron	Ergotamine tartrate	13I24-B10-288648	21540	46
Fagron	Ergotamine tartrate	13I24-B10-288650	21556	60
Fagron	Ergotamine tartrate	15B16-B05-308418	22361 [†]	15
Fagron	Ergotamine tartrate	15B16-B05-308418	22361SI [†]	15

- 81 112 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ergotamine tartrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ergotamine tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ergotamine tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	140	0	75 738
Type B	0	171	65	81 112
Type C	0	0	0	56 001

The substance/substance group *Ergotamine tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.7143 %)
Type B	100.0000 % (> 99.9853 %)	72.4576 % (> 71.1864 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22361	22361	0.00	45.59
22722	22361	12.04	45.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Erythromycin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20011-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Erythromycin; Erythromycinum

Special notes

When selecting the *Erythromycin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Erythromycin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Erythromycin	81907518	20011	80	I 2009 000 262
Fagron	Erythromycin	12E24-N04	21056	40	20120607
Caelo	Erythromycin	13175601	21323	40	20130620
Euro OTC	Erythromycin	1308016-02	21651	40	1412542
Fagron	Erythromycin	14B06-B35-290872	21669	40	20140225
Euro OTC	Erythromycin	1508034	21890	40	20150925*
Caelo	Erythromycin	160792	22438	40	20160408*
Euro OTC	Erythromycin	1607038	22832	40	20160831*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 8 reference samples from the substance/substance group *Erythromycin*. These samples are listed above in the [calibration samples](#) section.
- 75 518 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 540 spectra of 12 reference samples from the substance/substance group *Erythromycin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Erythromycin	10006107	20107	40
Fagron	Erythromycin	pending	21011	90
Fagron	Erythromycin	pending	21012	50
Euro OTC	Erythromycin	1308016-02	21651 [†]	20
Fagron	Erythromycin	14B06-B35-290872	21669 [†]	20
Euro OTC	Erythromycin	1508034	21890 [†]	20
Caelo	Erythromycin	160792	22438 [†]	20
Caelo	Erythromycin	160795	22439	60
Caelo	Erythromycin	160797	22440	60
Caelo	Erythromycin	160796	22442	60
Fagron	Erythromycin	14B06-B35-290872	21669SI	43
Euro OTC	Erythromycin	1508034	21890SI	57

- 80 808 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1058 spectra from 260 *Apo-Ident* customers from 307 batches from the substance/substance group *Erythromycin*.

Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	10079203	1
Caelo	Erythromycin	3081601	1
Fagron	Erythromycin	11D13-N09	3
Caelo	Erythromycin	10091502	1
Caelo	Erythromycin	11195402	5
Caelo	Erythromycin	120503601	1
Caelo	Erythromycin	12156206	2
Caelo / Noweda	Erythromycin	1205036-02	1
Euro OTC	Erythromycin	1308016-01	21
Caelo	Erythromycin	1308016-01	4
Euro OTC	Erythromycin	130801601	6
GEHE 21.05.2014	Erythromycin	1308016-01	1
euroct/gehe	Erythromycin	1308016-01	1
Euro OTC	Erythromycin	1308016-02	22
euroct/gehe	Erythromycin	1308016-02	2
EuRho	Erythromycin	1308016-01	2
EuRho	Erythromycin	1308016-02	2
EuRho/Phönix	Erythromycin	1308016-02	1
Euro OTC	Erythromycin	130801602	2
Noweda	Erythromycin	130801602	2
Gehe	Erythromycin	1308016-02	1
Caelo	Erythromycin	1315802	1
Caelo	Erythromycin	13175502	7
Euro OTC	Erythromycin	1308016-1	1
Caelo	Erythromycin	13175503	9
Caelo	Erythromycin	13175505	3
Caelo	Erythromycin	13175601	5
Caelo	Erythromycin	13175506	3
Raben-Apotheke Mildenau	Erythromycin	13175601	2
Caelo	Erythromycin	13175604	5
PHOENIX 08.05.2014	Erythromycin	13175604	1
Caelo	Erythromycin	13175607	7
gehe	Erythromycin	13175607	1
Noweda	Erythromycin	13175608	1
Caelo	Erythromycin	13175608	6
Fagron	Erythromycin	13175608	1
Gutenberg-Apotheke	Erythromycin	13175608	1
PHOENIX 08.05.2014	Erythromycin	13175608	2
Caesar & Loretz	Erythromycin	13175610	2
Caelo	Erythromycin	13175801	9
Caelo	Erythromycin	13175802	7
Caelo	Erythromycin	13175803	7
Caelo	Erythromycin	13175808	3
Caelo	Erythromycin	13175804	2
Caelo	Erythromycin	13175809	8
Caelo	Erythromycin	13175810	4
Caelo	Erythromycin	13175811	5
Fagron	Erythromycin	13F12-N21	26
Fagron	Erythromycin	13H22-N070228/246	1
Caelo	Erythromycin	13178756tzgklhj	1
Caelo	Erythromycin	13D30-N01	6
Caelo	Erythromycin	13H22-N07	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Erythromycin	13D30-N01	24
Fagron	Erythromycin	13H22-N07	6
Fagron	Erythromycin	13H22-N07	1
Fagron	Erythromycin	14/30-B01-300060	1
Caelo	Erythromycin	14/30-B01-300059	1
Fagron	Erythromycin	14/30B0130050	1
Fagron	Erythromycin	1430-B01-303884	1
Fagron	Erythromycin	14/30-B01-303884	1
Caelo	Erythromycin		2
Caelo	Erythromycin	14/30-B01-308189	2
Fagron	Erythromycin		1
Fagron	Erythromycin	14/30-B01-308789	1
Caelo	Erythromycin	140440006	1
Caelo	Erythromycin	140044203	1
Caelo	Erythromycin	14044001	10
Fagron	Erythromycin	14044001	1
Caelo	Erythromycin	14044002	8
Caelo	Erythromycin	14044005	4
Caelo	Erythromycin	14044004	1
Noweda	Erythromycin	14044006	1
Eigenherstellung	Erythromycin	14044006	1
Caelo	Erythromycin	14044006	2
Caelo	Erythromycin	14044007	3
Caelo	Erythromycin	14044008	6
Caelo	Erythromycin	14044011	1
Caelo	Erythromycin	14044010	6
Caelo	Erythromycin	14044014	1
Caelo	Erythromycin	1404409	1
Caelo	Erythromycin	14044101	5
Caelo	Erythromycin	14044109	3
Caelo	Erythromycin	14044105	2
Phoenix	Erythromycin	14044106	1
Caelo	Erythromycin	14044110	2
Noweda21.04.2015	Erythromycin	14044110	1
Caelo	Erythromycin	14044115	4
Caelo	Erythromycin	14044114	3
Caelo	Erythromycin	14044118	3
Caelo	Erythromycin	14044201	5
Caelo	Erythromycin	14044202	2
Phönix	Erythromycin	14044201	1
OTG/Gehe	Erythromycin	1409019-01	1
Euro OTC	Erythromycin	14044205	1
Caelo	Erythromycin	14044206	1
Caelo	Erythromycin	14044205	3
Euro OTC	Erythromycin	140901901	5
Euro OTC	Erythromycin	1409019-01	15
Caelo	Erythromycin	14044207	2
Phoenix goettin	Erythromycin	1409019-01	1
Euro OTC	Erythromycin	1409019-02	15
Euro OTC	Erythromycin	140901902	1
Fagron	Erythromycin	1409019-02	1
Caelo	Erythromycin	1409019-02	2
Caelo	Erythromycin	140901902	1
Unisan	Erythromycin	140901902	1
Euro OTC	Erythromycin	14090-9-01	1
Caelo	Erythromycin	1414M-01362	1
Caelo	Erythromycin	1430b01300059	1
Fagron	Erythromycin	1430-b01-300060	1
Fagron	Erythromycin	1430B01303884	1
Fagron	Erythromycin	14B06-B35	9

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Erythromycin	14B06-B35	1
Caelo	Erythromycin	14B06-B35	2
Fagron	Erythromycin	14B06-B35-290866	4
Fagron	Erythromycin	14B06-B35-290872	3
Caelo	Erythromycin	14B06-B35-290872	2
Fagron	Erythromycin	14B06-B35-290873	3
Fagron	Erythromycin	14B06-B35290873	1
Caelo	Erythromycin	14B06-B35-290873	1
Fagron	Erythromycin	14B06-B35-290874	3
Fagron	Erythromycin	14B06-B35-290875	8
Fagron	Erythromycin	14B06-B35-293508	2
Caelo	Erythromycin	14b06-b35-293508	1
Noweda/Gehe	Erythromycin	14B06-B35-293508	1
Fagron	Erythromycin	14B06-B35-293509	4
Fagron	Erythromycin	14b06-b35-293509	1
Fagron	Erythromycin	14F13-B02	1
Fagron	Erythromycin	14Bo6-B35	1
Fagron	Erythromycin	14F13-B02-293490	2
Fagron	Erythromycin	14F13-B02-300061	3
Fagron	Erythromycin	14F13-B02-293511	3
Fagron	Erythromycin	14F13-B02-293488	1
Fagron	Erythromycin	14F13-B02-293487	1
Caelo	Erythromycin	14F13-B02-296464	2
Fagron	Erythromycin	14F13-B12-300061	1
Caelo	Erythromycin	14I30-B01	1
Fagron	Erythromycin	14I30-B01	3
Fagron	Erythromycin	14I30B01	1
Fagron	Erythromycin	14I30-B01-3000060	1
Fagron	Erythromycin	14I30-B01-300050	2
Fagron	Erythromycin	14i30b01-300059	1
Fagron	Erythromycin	14I30-B01-300062	2
Fagron	Erythromycin	14I30-B01-303884	5
Fagron	Erythromycin	14i30-b01-303884	1
Fagron	Erythromycin	14I30-B01-306927	1
Fagron	Erythromycin	14I30B01308189	1
Fagron	Erythromycin	14I30-B01-308188	3
Fagron	Erythromycin	14I30-B01-308189	1
Fagron	Erythromycin	14I30-B01-311166	2
Fagron	Erythromycin	14i30-b01-311166	1
Caelo	Erythromycin	15042601	1
Caelo	Erythromycin	15042602	2
Caelo	Erythromycin	15042604	2
caesar&loretz,phönix	Erythromycin	15042603	1
Caelo	Erythromycin	15042603	2
Calo/AHD	Erythromycin	15042605	1
Caelo	Erythromycin	15042605	1
Caelo	Erythromycin	15042608	2
Caelo	Erythromycin	15042609	4
Phoenix	Erythromycin	15042609	1
Caelo	Erythromycin	15042610	4
Caelo	Erythromycin	15042611	1
Caelo	Erythromycin	15042613	2
Caesar&Loretz GmbH /Anzag	Erythromycin	15042610	1
Caelo	Erythromycin	15042612	3
Caelo	Erythromycin	15042701	4
Caelo	Erythromycin	15042702	3
Caelo	Erythromycin	15042703	6
Caelo	Erythromycin	15042704	3
Caelo	Erythromycin	15042705	4
Caelo	Erythromycin	15042706	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	15042803	6
Caelo	Erythromycin	15042711	2
Caelo	Erythromycin	15042802	1
Caelo	Erythromycin	15042707	1
Caelo	Erythromycin	15042708	1
Rondell Apotheke	Erythromycin	15042803	1
Caelo	Erythromycin	15042806	4
Caelo	Erythromycin	15042810	1
Caesar&Loretz GmbH	Erythromycin	15042807	1
Caelo	Erythromycin	15042809	1
Phoenix	Erythromycin	15042811	1
Caelo	Erythromycin	15042811	1
Caelo	Erythromycin	15042813	5
Caesar & Loretz/AHC	Erythromycin	15042813	1
Caelo	Erythromycin	15042814	2
Caelo	Erythromycin	15042901	2
Euro OTC	Erythromycin	15080-01	1
Euro OTC	Erythromycin	1508034-01	15
Euro/Gehe	Erythromycin	1508034-01	1
Noweda	Erythromycin	150803401	1
Caelo	Erythromycin	1508034-02	1
Euro OTC	Erythromycin	1508034-02	7
Caelo	Erythromycin	15245002	8
Caelo	Erythromycin	1524004	1
Caelo	Erythromycin	15245003	4
Wolff/AHD	Erythromycin	15245004	1
Caelo	Erythromycin	15245004	6
EuRho/Sanacorp	Erythromycin	15245004	1
Gehe	Erythromycin	15245004	1
Caelo	Erythromycin	15245005	1
Caelo	Erythromycin	15245008	1
Caelo	Erythromycin	15245101	4
Noweda	Erythromycin	15245101	1
Caelo	Erythromycin	154042602	1
Euro OTC	Erythromycin	1607038-01	4
Caelo	Erythromycin	16079203	4
Caelo	Erythromycin	16079208	1
Caelo	Erythromycin	16079204	2
Fagron	Erythromycin	16G06-B03-324463	1
Fagron	Erythromycin	16G06-B03-324466	1
Fagron	Erythromycin	16G06-B03-324464	1
Caelo	Erythromycin	24071402	1
Caelo	Erythromycin	28041505	1
Caelo	Erythromycin	28101405	1
Fagron	Erythromycin	3000-50	1
Caelo	Erythromycin	30011505	1
Caelo	Erythromycin	5042604	1
Sanacorp	Erythromycin	60/AKD52	1
Caelo	Erythromycin	60/AKD4	1
Sanacorp	Erythromycin		1
Fagron	Erythromycin	EB032J13	4
Sanacorp	Erythromycin	59/AKD51	1
Fagron	Erythromycin	EB022E14	3
Fagron	Erythromycin	EB068/14	1
Fagron	Erythromycin	EB06814	1
Euro OTC	Erythromycin	EBS/1408-BM-001	1
Euro OTC	Erythromycin	80616-4	1
Caelo	Erythromycin	eb078b13	1
Euro OTC	Erythromycin	EBS/1307-BM-001	1
Klenk	Erythromycin	EB068I14	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Erythromycin	10006206	1
Fagron	Erythromycin	510211362	1
Caelo	Erythromycin	511111	1
Euro OTC	Erythromycin	1013u-01362	1
Caelo	Erythromycin	1021703	1
Caelo	Erythromycin	10217101	1
Caelo	Erythromycin	10217105	1
Caelo	Erythromycin	10217103	1
Caelo	Erythromycin	10217106	1
Caelo	Erythromycin	10217102	1
Caelo	Erythromycin	10217107	1
Caelo	Erythromycin	10217204	1
Caesar & Loretz GmbH, 4...	Erythromycin	10217208	1
Caelo	Erythromycin	10217501	1
Caelo	Erythromycin	10217412	1
Euro OTC	Erythromycin	1106036-04	2
Fagron	Erythromycin	11/06-N05	1
Erika apotheke	Erythromycin	11/06-N05	1
Phönix Gotha	Erythromycin	1106036-04	1
Sanacorp	Erythromycin	1106036-04	1
Euro OTC	Erythromycin	1106036-05	6
Phönix Gotha	Erythromycin	1106036-05	1
Europharm/Otto	Erythromycin	1106036-05	2
Fagron	Erythromycin	1106036-05	3
Gehe	Erythromycin	1106036-05	1
Caelo	Erythromycin	11195302	2
EuRho/Phönix	Erythromycin	1106036-05	1
Caelo	Erythromycin	11195306	1
Phönix 30.08.2012	Erythromycin	11195305	1
Caelo	Erythromycin	11195404	2
Caelo	Erythromycin	11195405	3
Caelo	Erythromycin	11195406	1
Caelo	Erythromycin	11195407	4
VDL	Erythromycin	11195407	1
Caelo	Erythromycin	11195408	1
Gehe	Erythromycin	11195412	1
Caelo	Erythromycin	11195412	1
Noweda	Erythromycin	11195413	1
Caelo	Erythromycin	1195306	1
Phoenix, 13.09.2012	Erythromycin	1195305	1
Caelo	Erythromycin	1195407	1
Gehe	Erythromycin	11D13-N09	1
Fagron	Erythromycin	11J06-N05	3
Caelo	Erythromycin	11j06-n05	1
Fagron	Erythromycin	11j06-n05	1
Phönix Gotha	Erythromycin	11J06-N05	1
Post-Apotheke	Erythromycin	11J06-N05	3
Fagron	Erythromycin	11J06-No5	1
PhytoComm	Erythromycin	1203ery	1
ANZAG am 16.05.2012	Erythromycin	11J06-N05	1
EuRho/Phönix	Erythromycin	1205035	1
Euro OTC	Erythromycin	1205035-01	13
Anzag 23.11.12 ek:26,49	Erythromycin	1205035-01	1
Phönix	Erythromycin	120503501	1
EuRho	Erythromycin	1205035-01	1
Fagron	Erythromycin	1205035-01	1
Caelo	Erythromycin	120503502	1
Euro OTC	Erythromycin	1205035-02	14
Sanacorp	Erythromycin	1205035-02	1
Alliance Health	Erythromycin	120503502	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
EuRho	Erythromycin	1205035-02	1
Euro OTC	Erythromycin	120503502	1
Euro OTC	Erythromycin	1205036-01	7
Euro OTC	Erythromycin	120503601	1
EuRho	Erythromycin	1205036-01	1
Euro OTC	Erythromycin	1205036-02	9
Euro OTC	Erythromycin	120503602	2
phönix	Erythromycin	1205036-02	1
Phönix 11.11.2013	Erythromycin	1205036-02	1
Phönix	Erythromycin	1205036-02	1
Caelo	Erythromycin	12152103	3
Caelo	Erythromycin	12152101	3
Caelo	Erythromycin	12152102	3
Gehe	Erythromycin	12152103	1
Caelo	Erythromycin	12152104	3
Gehe	Erythromycin	12152104	1
Caelo	Erythromycin	12152105	6
Gehe	Erythromycin	12152105	1
Caelo	Erythromycin	12152108	5
Caelo	Erythromycin	12152107	1
Caelo	Erythromycin	12152109	11
Caelo	Erythromycin	1215219	1
Caelo	Erythromycin	12152201	8
Phoenix	Erythromycin	12152201	2
Caelo	Erythromycin	12152202	4
Caelo	Erythromycin	12152203	1
Caelo	Erythromycin	12152205	10
Gehe 20.03.2013	Erythromycin	12152205	1
Caelo	Erythromycin	12152206	10
Caelo	Erythromycin	12152208	3
Caelo	Erythromycin	12156201	3
Fagron	Erythromycin	12152209	1
AHD, 11.09.2013	Erythromycin	12152210	1
Caelo	Erythromycin	12156202	6
Caelo	Erythromycin	12156203	2
Caelo	Erythromycin	12156204	4
Caelo	Erythromycin	12156207	4
AHC 04.07.13 EK38,50	Erythromycin	12156207	1
Caelo	Erythromycin	12156208	6
Sanacorp	Erythromycin	12156208	1
Fagron	Erythromycin	12e24-n04	1
Fagron	Erythromycin	12E24-N04	18
Noweda	Erythromycin	12E24-N04	2
Gehe	Erythromycin	12E24-N04	1
Großhandel	Erythromycin	12E24-N04	1
Anzag	Erythromycin	12e24-n04	1
Caelo	Erythromycin	12E24-N04	2
Alliance Healthcare	Erythromycin	12E24-N04	1
Fagron	Erythromycin	12E24-No4	1
Fagron	Erythromycin	12J30-N01	12
Fagron	Erythromycin	12J30N01	1
Fagron	Erythromycin	12J30-N01	1
Phönix 27.04.2013	Erythromycin	12J30-N01	1
Caelo	Erythromycin	1315501	1
Caelo	Erythromycin	13145504	1
Caelo	Erythromycin	13175501	6
gepepharm GmbH	Erythromycin	13175502	1
Fagron	Erythromycin	13175503	1
Caelo	Erythromycin	13175504	5
Caelo	Erythromycin	131756017	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar&loretz,Phoenix	Erythromycin	13175602	1
Noweda	Erythromycin	13175603	2
Caelo	Erythromycin	13175603	8
Euro CT Phönix	Erythromycin	13175604	1
Phoenix	Erythromycin	13175608	1
Caelo	Erythromycin	13189001	6
Gehe	Erythromycin	13189001	2
Caesar & Loretz GmbH, 4...	Erythromycin	13189002	1
Caelo	Erythromycin	13189002	7
gehe 24.8.13	Erythromycin	13189002	1
Gehe	Erythromycin	13189004	1
Caelo	Erythromycin	13189004	3
Caeolo/Noweda	Erythromycin	13189007	1
Caelo	Erythromycin	132152108	1
Fagron	Erythromycin	13A02-N06	9
Caelo	Erythromycin	13189006	1
Caelo	Erythromycin	13189007	1
Caelo	Erythromycin	13A02-N06	1
Fagron	Erythromycin	13A02N06	1
post apotheke	Erythromycin	13A02-N06	1
Phönix, 28.10.2013	Erythromycin	13A02-N06	1
Fagron	Erythromycin	13A02-N060571/680	1
Fagron	Erythromycin	13D30-N010336/730	1
Fagron	Erythromycin	13D30-N01003/456	1
Fagron	Erythromycin	13d30-n01	1
GEHE	Erythromycin	13D30-N01	1
Fagron	Erythromycin	13d30-N01	1
AHD, 25.07.2013	Erythromycin	13D30-N01	1
Fagron	Erythromycin	13D30N01	1
Fagron	Erythromycin	13D30-N010278/730	1
AHD, 25.11.13	Erythromycin	13F12-N21	1
Alliance Healthcare	Erythromycin	13F12-N21	1
Gehe	Erythromycin	13F12-N21	1
Fagron	Erythromycin	13H22-N070126/246	1
Sanacorp	Erythromycin	13H22-N07	1
Caelo	Erythromycin	1404414	1
Caesar&loretz,Phoenix	Erythromycin	14044004	1
Euro OT	Erythromycin	1409019-02	1
Caelo	Erythromycin	16071302	1
Caelo	Erythromycin	19071306	1
Caelo	Erythromycin	20270912-3	1
Caelo	Erythromycin	22041302	1
Caelo	Erythromycin	24101312	1
Caelo	Erythromycin	26101204	1
Caelo	Erythromycin	25011304	1
Caelo	Erythromycin	27131-01362	1
Caelo	Erythromycin	26011402	1
Caelo	Erythromycin	27071202	1
Caelo	Erythromycin	3110195	1
Euro OTC	Erythromycin	3613A1362	1
Euro OTC	Erythromycin	4112Q-01362	1
Caelo	Erythromycin	59/AKD59	1
Fagron	Erythromycin	4212E-01362	1
Fagron	Erythromycin	E-250213-2	1
Fagron	Erythromycin	E-030613-1	1
Euro OTC	Erythromycin	700770	1
Fagron	Erythromycin	EBS/1201-008	2
Fagron	Erythromycin	EB048G12	1
Euro OTC	Erythromycin	EBS/1205-M-040	1
Fagron	Erythromycin	EB078B13	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Erythromycin	EBS/1205-M-041	1
Phagron	Erythromycin		1
Fagron	Erythromycin	11195302	1
Caelo	Erythromycin	11195411	1
Symbiotica	Erythromycin	12152201	1
Anzag	Erythromycin	12152206	1
Euro OTC	Erythromycin	12A02-N06	1
Caelo	Erythromycin	13175504-3413310132	1
Caelo	Erythromycin	13175506-3559412014	1
AHD	Erythromycin	13189002	1

- 54 943 spectra from 335 *Apo-Ident* customers from a total of 20 306 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Erythromycin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Erythromycin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	75 518
Type B	0	450	90	80 808
Type C	0	1028	30	54 943

The substance/substance group *Erythromycin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9853 %)	83.3333 % (> 82.7778 %)
Type C	100.0000 % (> 99.8622 %)	97.1645 % (> 96.8809 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20011	20011	0.00	42.94
21056	20011	6.57	45.22
21323	21890	4.83	47.50
21651	21651	0.00	24.69
21669	21651	10.41	28.65
21890	21890	0.00	43.56
22438	22438	0.00	52.45
22832	22832	0.00	38.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Estradiol benzoate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20098-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Estradiol benzoate; Estradioli benzoas; Oestradiolum benzoicum

Special notes

When selecting the *Estradiol benzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Estradiol benzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol benzoate	12H02-N02	20889	40	20120817
Fagron	Estradiol benzoate	14B20-B02	21257	40	20140327
Euro OTC	Estradiol benzoate	1301006-02	21290	40	1507405
Euro OTC	Estradiol benzoate	1507009	21869	40	0000010566
Fagron	Estradiol benzoate	12H02-N02	20889SI	40	20120817
Fagron	Estradiol benzoate	14B20-B02	21257SI	40	20140327
Euro OTC	Estradiol benzoate	1507009	21869SI	40	0000010566

Validation samples

A total of 213 227 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 *Estradiol benzoate*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 7 reference samples from the substance/substance group *Estradiol benzoate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol benzoate	13277607	21324	40
Euro OTC	Estradiol benzoate	1507009	21869 [†]	20
Euro OTC	Estradiol benzoate	1611004	22873	40
Fagron	Estradiol benzoate	12H02-N02	20889SI [†]	20
Fagron	Estradiol benzoate	14B20-B02	21257SI [†]	20
Euro OTC	Estradiol benzoate	1507009	21869SI [†]	20
Euro OTC	Estradiol benzoate	1611004	22873SI	40

- 81 148 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 211 spectra from 123 *Apo-Ident* customers from 68 batches from the substance/substance group *Estradiol benzoate*.

[†]These spectra were recorded from 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
Euro OTC	Estradiol benzoate	1301006-02	8
Caelo	Estradiol benzoate	13276401	6
Euro OTC	Estradiol benzoate	1201019-01	7
Caelo	Estradiol benzoate	13277605	5
Caelo	Estradiol benzoate	13277607	3
Fagron	Estradiol benzoate	13C15-B07-288645	1
Euro OTC	Estradiol benzoate	1401001-01	9
Euro OTC	Estradiol benzoate	14010001-01	1
Euro OTC	Estradiol benzoate	1412033-01	5
Fagron	Estradiol benzoate	1412033-01	1
Fagron	Estradiol benzoate	14B20-B02	3
Fagron	Estradiol benzoate	14B20-B02-2920001	1
Fagron	Estradiol benzoate	14B20-B02-292001	3
AHD	Estradiol benzoate	14B20-B02-292001	1
Fagron	Estradiol benzoate	14B20-B02-294949	4
Caelo	Estradiol benzoate	14B20-B02-294949	1
Fagron	Estradiol benzoate	14b20-b02-294949	1
phönix	Estradiol benzoate	14B20-B02-294949	1
Euro OTC	Estradiol benzoate	1507009-01	3
Euro OTC	Estradiol benzoate	150700901	1
Caelo	Estradiol benzoate	15078602	4
Caelo	Estradiol benzoate	15078603	10
Caelo	Estradiol benzoate	15078604	4
Fagron	Estradiol benzoate	15C10-B04-305523	3
Caelo	Estradiol benzoate	15C10B04305523	1
Fagron	Estradiol benzoate	15c10-b04-305523	1
Caelo	Estradiol benzoate	15C10-B04-305523	1
Fagron	Estradiol benzoate	15E08-B08-311705	2
Fagron	Estradiol benzoate	83101340	1
Euro OTC	Estradiol benzoate	83101340	1
Fagron	Estradiol benzoate	84303830	1
Sanacorp	Estradiol benzoate	10/AKD24	1
Euro OTC	Estradiol benzoate	8011422	1
Caelo	Estradiol benzoate	6091305	1
Caelo	Estradiol benzoate		4
Noweda	Estradiol benzoate	1003040-01	2
Caelo	Estradiol benzoate	84303830	1
Euro OTC	Estradiol benzoate	1007037-02	1
euroho/gehe	Estradiol benzoate	1007037-02	1
Bayer-Schering	Estradiol benzoate	1007037-03	1
aliance healthcare 5.12...	Estradiol benzoate	10118576	1
Caelo	Estradiol benzoate	10124909	3
Caelo	Estradiol benzoate	10124912	1
v.d.l	Estradiol benzoate	10124913	1
Caelo	Estradiol benzoate	10124915	2
Caelo	Estradiol benzoate	10124913	1
Caelo	Estradiol benzoate	10124918	2
Caelo	Estradiol benzoate	10124919	1
Caelo	Estradiol benzoate	10124921	3
Fagron	Estradiol benzoate	11L23-N01	1
Gehe	Estradiol benzoate	11L23-N01	1
Caelo	Estradiol benzoate	11L23-N01	1
Euro OTC	Estradiol benzoate	1201019-02	11
A.H. 07.06.13 ek: 24,14EUR	Estradiol benzoate	1201019-02	1
Phönix	Estradiol benzoate	1201019-02	1
EuRho/Sanacorp	Estradiol benzoate	1201019-02	1
Euro OTC	Estradiol benzoate	121019-01	1
Caelo	Estradiol benzoate	12255903	2
Fagron	Estradiol benzoate	12255903	1
Caelo	Estradiol benzoate	12255904	13

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Estradiol benzoate	12255905	15
Fagron	Estradiol benzoate	12H02-N02	4
GEHE	Estradiol benzoate	12H02-N02	1
Fagron	Estradiol benzoate	12H02-N052	1
Fagron	Estradiol benzoate	12h02-n02	2
Fagron	Estradiol benzoate	13/11-N01	2
Euro OTC	Estradiol benzoate	130100601	1
Fagron	Estradiol benzoate	12L14-N02	1
Euro OTC	Estradiol benzoate	1301006-01	1
Alliance Healthcare	Estradiol benzoate	1301006-01	1
Caelo	Estradiol benzoate	13277602	9
Caelo	Estradiol benzoate	13277603	2
Fagron	Estradiol benzoate	13C15-B07-288646	1
Noweda	Estradiol benzoate	13277603	1
Fagron	Estradiol benzoate	13I11-N01	1
Fagron	Estradiol benzoate	13I11N01	1
Caelo	Estradiol benzoate	2021211-1	1
Caelo	Estradiol benzoate	21121204	1
Fagron	Estradiol benzoate	2x12L14-N02	1
Fagron	Estradiol benzoate	81403680	1
Fagron	Estradiol benzoate	81403690	1
Fagron	Estradiol benzoate	81403700	1
Caelo	Estradiol benzoate	92137389	1
Caelo	Estradiol benzoate	81403700	1
GEHE	Estradiol benzoate	12B08-N05	1
Gehe	Estradiol benzoate	10124913	1
Caelo	Estradiol benzoate	1301006-02	1

- 55 790 spectra from 335 *Apo-Ident* customers from a total of 20 544 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Estradiol benzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol benzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	200	0	81 148
Type C	0	172	39	55 790

The substance/substance group *Estradiol benzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8622 %)	81.5166 % (> 80.0948 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20889	21290	3.20	64.50
21257	21290	1.05	63.99
21290	21290	0.00	63.51
21869	21869	0.00	64.07

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Estradiol hemihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20497-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Estradiol hemihydrate; Estradiolum hemihydricum; Oestradiolum hemihydricum

Special notes

When selecting the *Estradiol hemihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Estradiol hemihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol hemihy...	11H23-N02	20497	40	AR-15-FG-001193-01
Caelo	Estradiol hemihy...	11078109	20503	40	AR-13-FG-008661-01
Euro OTC	Estradiol hemihy...	1208022-01	21291	40	20121012
Caelo	Estradiol hemihy...	12268016	21302	40	1410502
Caelo	Estradiol hemihy...	13285802	21499	40	20130913
Caelo	Estradiol hemihy...	13285802	21500	40	1510622

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Estradiol hemihy...	13285802	21508	40	1410504
Fagron	Estradiol hemihy...	14G24-B04-297404	21667	40	20140825
Euro OTC	Estradiol hemihy...	1507013	21847	40	1510623
Euro OTC	Estradiol hemihy...	1510039	21945	40	20151103*
Euro OTC	Estradiol hemihy...	1601017	22307	30	20160122*
Euro OTC	Estradiol hemihy...	1612008	22913	40	20170117*
Caelo	Estradiol hemihy...	13285802	21499SI	40	20130913
Caelo	Estradiol hemihy...	13285802	21500SI	40	1510622
Euro OTC	Estradiol hemihy...	1507013	21847SI	40	1510623
Euro OTC	Estradiol hemihy...	1510039	21945SI	69	20151103*
Euro OTC	Estradiol hemihy...	1612008	22913SI	40	20170117*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 699 spectra of 17 reference samples from the substance/substance group *Estradiol hemihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 179 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 655 spectra of 29 reference samples from the substance/substance group *Estradiol hemihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Estradiol hemihydrate	13K22-N01	21263	40
Caelo	Estradiol hemihydrate	13285802	21499 [†]	20
Caelo	Estradiol hemihydrate	13285802	21500 [†]	20
Caelo	Estradiol hemihydrate	13285802	21501	20
Caelo	Estradiol hemihydrate	13285802	21502	20
Caelo	Estradiol hemihydrate	13285802	21503	20
Caelo	Estradiol hemihydrate	13285802	21504	20
Caelo	Estradiol hemihydrate	13285802	21505	20
Caelo	Estradiol hemihydrate	13285802	21506	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol hemihydrate	13285802	21507	20
Caelo	Estradiol hemihydrate	13285802	21508 [†]	20
Fagron	Estradiol hemihydrate	14G24-B04-297404	21667 [†]	15
Euro OTC	Estradiol hemihydrate	1507013	21847 [†]	20
Euro OTC	Estradiol hemihydrate	1510039	21945 [†]	20
Euro OTC	Estradiol hemihydrate	1601017	22307 [†]	15
Euro OTC	Estradiol hemihydrate	1607003	22712	40
Caelo	Estradiol hemihydrate	13285802	21499SI [†]	20
Caelo	Estradiol hemihydrate	13285802	21500SI [†]	20
Caelo	Estradiol hemihydrate	13285802	21501SI	20
Caelo	Estradiol hemihydrate	13285802	21502SI	20
Caelo	Estradiol hemihydrate	13285802	21503SI	20
Caelo	Estradiol hemihydrate	13285802	21504SI	20
Caelo	Estradiol hemihydrate	13285802	21505SI	20
Caelo	Estradiol hemihydrate	13285802	21506SI	20
Caelo	Estradiol hemihydrate	13285802	21507SI	20
Euro OTC	Estradiol hemihydrate	1507013	21847SI [†]	20
Euro OTC	Estradiol hemihydrate	1510039	21945SI [†]	20
Euro OTC	Estradiol hemihydrate	1601017	22307SI	45
Euro OTC	Estradiol hemihydrate	1607003	22712SI	40

- 80693 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 84 spectra from 53 *Apo-Ident* customers from 46 batches from the substance/substance group *Estradiol hemihydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Estradiol hemihydrate	11078105	1
Fagron	Estradiol hemihydrate	12268011	2
Caelo	Estradiol hemihydrate	12268012	4
Euro OTC	Estradiol hemihydrate	1308003-01	2
Caelo	Estradiol hemihydrate	13285802	4
phönix	Estradiol hemihydrate	13285802	1
Caelo	Estradiol hemihydrate	13285811	3
Fagron	Estradiol hemihydrate	13E07-N02	3
Fagron	Estradiol hemihydrate	13K22-N01	8
Fagron	Estradiol hemihydrate	13K22N01	1
Fagron	Estradiol hemihydrate	14G24-B04-297402	3
Euro OTC	Estradiol hemihydrate	1411024-01	1
Euro OTC	Estradiol hemihydrate	14G24-B04-297402	1
Euro OTC	Estradiol hemihydrate	1404030-01	1
Fagron	Estradiol hemihydrate	14G24-B04-297405	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
Fagron	Estradiol hemihydrate	14G24-B04-297404	1
Fagron	Estradiol hemihydrate	14G24-B04-302446	1
Fagron	Estradiol hemihydrate	14G24-B04-297406	1
Caelo	Estradiol hemihydrate	15038004	3
Caelo	Estradiol hemihydrate	15038010	1
Caelo	Estradiol hemihydrate	1503801	1
Euro OTC	Estradiol hemihydrate	1510039-01	1
Fagron	Estradiol hemihydrate	15D01-B02-308190	1
Fagron	Estradiol hemihydrate	15D01-B02-319032	1
Euro OTC	Estradiol hemihydrate	1601017-01	1
Caelo	Estradiol hemihydrate	19051501	1
Fagron	Estradiol hemihydrate	302446	1
Fagron	Estradiol hemihydrate	83100820	2
Fagron	Estradiol hemihydrate	84201170	1
Caelo	Estradiol hemihydrate	84201560	1
Caelo	Estradiol hemihydrate	9248916	1
Fagron	Estradiol hemihydrate	9J27-N05	1
Alliance Health 27.05.2...	Estradiol hemihydrate	9A09-N26	1
Caelo	Estradiol hemihydrate	11078104	1
Fagron	Estradiol hemihydrate	11031401	1
Caelo	Estradiol hemihydrate	11078113	1
Fagron	Estradiol hemihydrate	11H23-N02	1
Caelo	Estradiol hemihydrate	12172003	2
Caelo	Estradiol hemihydrate	12268003	2
Noweda	Estradiol hemihydrate	12268008	1
Fagron	Estradiol hemihydrate	12F29-N03	6
Fagron	Estradiol hemihydrate	12F29-N03	1
Fagron	Estradiol hemihydrate	12L19-N07	6
Fagron	Estradiol hemihydrate	12L29-N07	1
Caelo	Estradiol hemihydrate	13285801	1
Caelo	Estradiol hemihydrate	22101301	1
Gehe	Estradiol hemihydrate	82404160	1
Euro OTC	Estradiol hemihydrate	1607003-01	1

- 55 917 spectra from 335 *Apo-Ident* customers from a total of 20 565 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Estradiol hemihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol hemihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	699	0	75 179
Type B	0	655	0	80 693
Type C	0	82	2	55 917

The substance/substance group *Estradiol hemihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 99.1416 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 99.0840 %)
Type C	100.0000 % (> 99.8622 %)	97.6190 % (> 94.0476 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20497	20497	0.00	36.32
20503	20503	0.00	37.38
21291	21945	2.94	36.44
21302	21302	0.00	34.54
21499	21945	6.88	33.37
21500	21500	0.00	40.95
21508	21508	0.00	38.80
21667	21945	1.56	35.98
21847	21847	0.00	42.49
21945	21945	0.00	37.11
22307	22307	0.00	37.41
22913	22913	0.00	35.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Estradiol valerate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20330-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Estradiol valerate; Estradioli valeras; Oestradiolum valerianicum

Special notes

When selecting the *Estradiol valerate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Estradiol valerate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol valerate	11G18-N04	20330	40	AR-12-FG-012141-01
Fagron	Estradiol valerate	12D18-N02	20651	40	20120426
Fagron	Estradiol valerate	12D18-N02	21266	40	20120118
Caelo	Estradiol valerate	13264001	21411	40	1410503
Caelo	Estradiol valerate	13264001	21416	60	1510624
Caelo	Estradiol valerate	13264001	21424	40	1410503

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Estradiol valerate	14E26-B02-294846	21646	40	20140616
Caelo	Estradiol valerate	15194802	21989	40	20150708
Caelo	Estradiol valerate	163277	23056	40	20161221*
Caelo	Estradiol valerate	13264001	21411SI	30	1410503
Caelo	Estradiol valerate	13264001	21416SI	30	1510624
Caelo	Estradiol valerate	15194802	21989SI	20	20150708
Caelo	Estradiol valerate	163277	23056SI	40	20161221*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 500 spectra of 13 reference samples from the substance/substance group *Estradiol valerate*. These samples are listed above in the [calibration samples](#) section.
- 75 378 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 427 spectra of 22 reference samples from the substance/substance group *Estradiol valerate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol valerate	13264001	21411 [†]	20
Caelo	Estradiol valerate	13264001	21416 [†]	60
Caelo	Estradiol valerate	13264001	21417	20
Caelo	Estradiol valerate	13264001	21418	20
Caelo	Estradiol valerate	13264001	21419	20
Caelo	Estradiol valerate	13264001	21422	20
Caelo	Estradiol valerate	13264001	21423	20
Caelo	Estradiol valerate	13264001	21424 [†]	20
Caelo	Estradiol valerate	13264001	21425	20
Caelo	Estradiol valerate	13264001	21426	20
Fagron	Estradiol valerate	14E26-B02-294846	21646 [†]	20
Caelo	Estradiol valerate	15194802	21989 [†]	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Estradiol valerate	13264001	21411SI [†]	15
Caelo	Estradiol valerate	13264001	21416SI [†]	15
Caelo	Estradiol valerate	13264001	21417SI	14
Caelo	Estradiol valerate	13264001	21418SI	15
Caelo	Estradiol valerate	13264001	21419SI	15
Caelo	Estradiol valerate	13264001	21422SI	17
Caelo	Estradiol valerate	13264001	21423SI	15
Caelo	Estradiol valerate	13264001	21425SI	15
Caelo	Estradiol valerate	13264001	21426SI	16
Caelo	Estradiol valerate	15194802	21989SI [†]	10

- 80 921 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 83 spectra from 40 *Apo-Ident* customers from 43 batches from the substance/substance group *Estradiol valerate*.

Supplier	Substance	Batch	Spectra
Fagron	Estradiol valerate	13g09-n05	2
Fagron	Estradiol valerate	12A20-N10	3
Fagron	Estradiol valerate	814M-03259	1
Caelo	Estradiol valerate	13264001	1
Fagron	Estradiol valerate	13A07-N11	6
Fagron	Estradiol valerate	13D16-N10	4
Fagron	Estradiol valerate	13G09N05	1
Fagron	Estradiol valerate	13G09-N05	5
Fagron	Estradiol valerate	13I13-N02	2
Fagron	Estradiol valerate	14E26B02	2
Fagron	Estradiol valerate	14E26-B02-294844	1
Fagron	Estradiol valerate	14E26-B02-294845	2
Caelo	Estradiol valerate	14E26-B02-294845	1
Fagron	Estradiol valerate	14E26-B02-294847	1
Fagron	Estradiol valerate	14E26-B02-296348	3
Fagron	Estradiol valerate	14E26-b02-302872	1
Fagron	Estradiol valerate	14E26-B02-302873	1
Fagron	Estradiol valerate	15C10-B05-305395	2
Fagron	Estradiol valerate	15C10-B05	1
Bayer Pharma AG	Estradiol valerate	15C10-B05-305395	1
Fagron	Estradiol valerate	15C10-B05-308851	4
Caelo	Estradiol valerate	15c10-B05-305396	1
Caelo	Estradiol valerate	15C10B05308851	1
Fagron	Estradiol valerate	15c10-b05-309186	1
Fagron	Estradiol valerate	15C10-B05-314840	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
Fagron	Estradiol valerate	15C10-B05-313568	1
Fagron	Estradiol valerate	11G18-N04	1
Caelo	Estradiol valerate	5315A-03259	1
Fagron	Estradiol valerate	19c10-b05-318405	1
Caelo	Estradiol valerate	4214U-03259	1
Fagron	Estradiol valerate	10L20-N05	1
Fagron	Estradiol valerate	11J13-N09	1
Fagron	Estradiol valerate	11J13-No9	1
Fagron	Estradiol valerate	11K04-N04	1
Fagron	Estradiol valerate	11k04-n04	1
Noweda	Estradiol valerate	12A20-N10	1
Fagron	Estradiol valerate	12D18-N02	3
Caelo	Estradiol valerate	12G05-N09	2
Fagron	Estradiol valerate	12G05-N09	1
Fagron	Estradiol valerate	12G05N09	1
Fagron	Estradiol valerate	12K05-N02	2
Caelo	Estradiol valerate	13264002	1
Caelo	Estradiol valerate	13264003	1
Sanacorp	Estradiol valerate	13264002	1
Jenne	Estradiol valerate	13A07-N11	1
Fagron	Estradiol valerate	13a07-n11	1
Fagron	Estradiol valerate	13D16N10	1
Fagron	Estradiol valerate	82201620	1
Phoenix	Estradiol valerate	13G09-N05	1
Caelo	Estradiol valerate	test	1
Bayer Pharma GmbH	Estradiol valerate	82201620	1
Beiersdorf/AHD	Estradiol valerate	12A20-N10	1
Beiersdorf/AHD	Estradiol valerate	12G05-N09	2

- 55 918 spectra from 335 *Apo-Ident* customers from a total of 20 569 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Estradiol valerate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estradiol valerate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	500	0	75 378
Type B	0	427	0	80 921
Type C	0	81	2	55 918

The substance/substance group *Estradiol valerate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.5948 %)
Type C	100.0000 % (> 99.8622 %)	97.5904 % (> 93.9759 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20330	20330	0.00	59.45
20651	21416	2.21	39.80
21266	23056	4.70	53.38
21411	21411	0.00	38.22
21416	21416	0.00	39.28
21424	21424	0.00	46.60
21646	21424	5.98	51.86
21989	21424	2.76	45.21
23056	23056	0.00	55.74

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Estriol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20878-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Estriol; Estriolum; Oestriolum

Special notes

When selecting the *Estriol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Estriol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Estriol	12298706	20878	40	20121106
Fagron	Estriol	11J13-N07	21255	40	1412180
Caelo	Estriol	13256001	21390	50	1511155
Caelo	Estriol	13256001	21391	40	20130821
Caelo	Estriol	13256001	21393	40	20130821
Euro OTC	Estriol	1507026	21848	40	0000010671

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Estriol	1509042	21939	40	20151009*
Fagron	Estriol	16D15-B03-322957	22889	40	20160711
Caelo	Estriol	13256001	21390SI	40	1511155
Caelo	Estriol	13256001	21391SI	40	20130821
Euro OTC	Estriol	1507026	21848SI	40	0000010671
Euro OTC	Estriol	1509042	21939SI	40	20151009*
Fagron	Estriol	16D15-B03-322957	22889SI	40	20160711

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 530 spectra of 13 reference samples from the substance/substance group *Estriol*. These samples are listed above in the [calibration samples](#) section.
- 75 348 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 720 spectra of 30 reference samples from the substance/substance group *Estriol*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Estriol	1310002-01	21292	40
Caelo	Estriol	13256001	21390 [†]	20
Caelo	Estriol	13256001	21391 [†]	20
Caelo	Estriol	13256001	21392	20
Caelo	Estriol	13256001	21393 [†]	20
Caelo	Estriol	13256001	21394	20
Caelo	Estriol	13256001	21395	15
Caelo	Estriol	13256001	21399	15
Caelo	Estriol	13256001	21400	20
Caelo	Estriol	13256001	21401	20
Caelo	Estriol	13256001	21404	20
Euro OTC	Estriol	1507026	21848 [†]	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Estriol	1509042	21939 [†]	20
Caelo	Estriol	161382	22633	40
Euro OTC	Estriol	1606044	22711	40
Euro OTC	Estriol	1610035	22850	40
Caelo	Estriol	13256001	21390SI [†]	20
Caelo	Estriol	13256001	21391SI [†]	20
Caelo	Estriol	13256001	21392SI	20
Caelo	Estriol	13256001	21394SI	20
Caelo	Estriol	13256001	21395SI	15
Caelo	Estriol	13256001	21399SI	15
Caelo	Estriol	13256001	21400SI	20
Caelo	Estriol	13256001	21401SI	20
Caelo	Estriol	13256001	21404SI	20
Euro OTC	Estriol	1507026	21848SI [†]	20
Euro OTC	Estriol	1509042	21939SI [†]	20
Caelo	Estriol	161382	22633SI	40
Euro OTC	Estriol	1606044	22711SI	40
Euro OTC	Estriol	1610035	22850SI	40

- 80 628 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 139 spectra from 62 *Apo-Ident* customers from 65 batches from the substance/substance group *Estriol*.

Supplier	Substance	Batch	Spectra
Caelo	Estriol	10053206	1
Caelo	Estriol	11254402	2
Caelo	Estriol	10H30-N06	1
Caelo	Estriol	11254408	1
Noweda	Estriol	11254409	1
Caelo	Estriol	11254412	2
Caelo	Estriol	11254410	1
Fagron	Estriol	11D13-N11	1
Fagron	Estriol	11J13-N07	3
Noweda	Estriol	11J13-No7	1
Euro OTC	Estriol	1201020-01	1
Caelo	Estriol	12032503	4
Noweda	Estriol	12032504	1
Caelo	Estriol	12032504	2
Caelo	Estriol	12032507	5
Caelo	Estriol	12298702	2
Caelo	Estriol	12298704	7

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Estriol	12298706	3
Caelo	Estriol	12298707	2
Caesar § Lorenz GmbH	Estriol	12298712	1
Fagron	Estriol	12A26-N02	2
Fagron	Estriol	12F08-N06	1
Caelo	Estriol	12H06N02	1
Fagron	Estriol	12H06-N02	5
Caelo	Estriol	12H06-N02	2
Fagron	Estriol	12H06-No2	2
Euro OTC	Estriol	1310002-01	1
Fagron	Estriol	12K07-N15	2
Sanacorp	Estriol	13256004	1
Caelo	Estriol	13256004	9
Fagron	Estriol	13C15-N04	4
Fagron	Estriol	13D19-N02	1
Sanacorp	Estriol	13D19-N05	1
Fagron	Estriol	13H28-N01	3
Euro OTC	Estriol	1403011-01	3
Caelo	Estriol	14077901	1
Caelo	Estriol	14077904	6
Caelo	Estriol	14077903	2
Kehr/Apomix	Estriol	14077904	1
Euro OTC	Estriol	1409018-01	2
Caelo	Estriol	1409018-01	1
Caelo	Estriol	14272101	3
Caelo	Estriol	14272104	3
Noweda 19.05.2015	Estriol	14272104	1
Fagron	Estriol	14B06-B11-291563	1
Gehe 30.12.14	Estriol	14B06-B11-291563	1
Fagron	Estriol	14B06-B11-294565	1
Fagron	Estriol	14B06-B11-291565	1
Fagron	Estriol	14E13-B01-294034	3
Fagron	Estriol	14E13-B01	2
Fagron	Estriol	14E29-B02	1
Fischar/Gehe	Estriol	14H29-B02-298072	3
Caelo	Estriol	15028905	1
Caelo	Estriol	15297804	4
Caelo	Estriol	15028901	1
Fagron	Estriol	14H29-B02-298074	1
Caelo	Estriol	15297805	1
Ensbona/ Sanacorp	Estriol	16053405	1
Gehe	Estriol	16053405	1
Haihang Industry	Estriol	20130824	1
Euro OTC	Estriol	1606044-01	1
Caelo	Estriol	16053408	1
Caelo	Estriol	24031501	1
Caelo	Estriol	20040711-9	1
Caelo	Estriol	27061303	1
NWM CHina	Estriol	ES150304	1
Fagron	Estriol	81100490	1
Shandong Northwest Manu...	Estriol	ETL160302	1
Audor Pharma	Estriol	APL00036940E	2
Audor Pharma	Estriol	APL00036940E	1
Shandong Northwest Manu...	Estriol	ETL160419	1
fargon	Estriol	12a26-n02	1
Caelo	Estriol	16053405	1
Caelo	Estriol	13256001	1

- 55 862 spectra from 335 *Apo-Ident* customers from a total of 20 547 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Estriol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Estriol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	528	2	75 348
Type B	0	694	26	80 628
Type C	0	127	12	55 862

The substance/substance group *Estriol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	99.6226 % (> 99.0566 %)
Type B	100.0000 % (> 99.9853 %)	96.3889 % (> 95.9722 %)
Type C	100.0000 % (> 99.8622 %)	91.3669 % (> 89.2086 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20878	21939	3.30	40.36
21255	21255	0.00	42.94
21390	21390	0.00	27.55
21391	21390	1.01	27.77
21393	21390	3.44	29.66
21848	21848	0.00	28.40
21939	21939	0.00	37.37
22889	21255	7.56	46.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ethacridine lactate monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20750-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethacridine lactate monohydrate; Aethacridinum lacticum monohydricum; Ethacridini lactas monohydricus

Special notes

When selecting the *Ethacridine lactate monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethacridine lactate monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ethacridine lact...	12149507	20750	40	20120619
Fagron	Ethacridine lact...	13I24-N03	21265	40	AR-15-FG-007011-02
Euro OTC	Ethacridine lact...	1206016-02	21636	40	20121019
Fagron	Ethacridine lact...	15A29-B02-306219	22500	40	20150205

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ethacridine lactate monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Ethacridine lactate monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ethacridine lactate monohydr...	1206016-02	21636 [†]	20
Euro OTC	Ethacridine lactate monohydr...	1412034-02	22733	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 90 spectra from 66 *Apo-Ident* customers from 38 batches from the substance/substance group *Ethacridine lactate monohydrate*.

[†]These spectra were recorded from 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
Chinosol/Anzag	Ethacridine lactate monohydr...	914E-02196	1
Fagron	Ethacridine lactate monohydr...	14A15-B04-300493	1
Fagron	Ethacridine lactate monohydr...	12/24-N04	2
Euro OTC	Ethacridine lactate monohydr...	1206016-02	2
Euro OTC	Ethacridine lactate monohydr...	1206016-03	3
Fagron	Ethacridine lactate monohydr...	12G02-N13	7
Caelo	Ethacridine lactate monohydr...	12268407	3
Bombastus	Ethacridine lactate monohydr...	13/24-N03	1
Euro OTC	Ethacridine lactate monohydr...	13/24-N03	1
phoenix 18.11.2014	Ethacridine lactate monohydr...	13/24-N03	1
Fagron	Ethacridine lactate monohydr...	13I24-N03	7
Fagron	Ethacridine lactate monohydr...	13/24-N03	2
Fagron	Ethacridine lactate monohydr...	13/24-N03	1
Fagron	Ethacridine lactate monohydr...	13I24-N03	1
Caelo	Ethacridine lactate monohydr...	141203401	1
Caelo	Ethacridine lactate monohydr...	1412034-01	1
Euro OTC	Ethacridine lactate monohydr...	1412034-01	1
Caelo	Ethacridine lactate monohydr...	15177603	2
Caelo	Ethacridine lactate monohydr...	15438003	1
Caesar & Loretz GmbH Hi...	Ethacridine lactate monohydr...	15438007	1
Euro OTC	Ethacridine lactate monohydr...	2905007v-03	1
Dermapharm	Ethacridine lactate monohydr...	100201	2
Caelo	Ethacridine lactate monohydr...	10288702	1
Fagron	Ethacridine lactate monohydr...	11/07-N05	1
Fagron	Ethacridine lactate monohydr...	103485-0006	1
Fargon	Ethacridine lactate monohydr...	11D07-N03	1
Caelo	Ethacridine lactate monohydr...	11J07-N05	1
Caelo	Ethacridine lactate monohydr...	11173703	1
Caelo	Ethacridine lactate monohydr...	12149507	3
Gehe	Ethacridine lactate monohydr...	12G02-N13	1
Caelo	Ethacridine lactate monohydr...	12G02-N13	2
Fagron	Ethacridine lactate monohydr...	12G02-N135-15	1
Fagron	Ethacridine lactate monohydr...	12J24-N04	1
Fagron	Ethacridine lactate monohydr...	201205001	3
Phonix	Ethacridine lactate monohydr...	13I24-N03	1
Euro OTC	Ethacridine lactate monohydr...	2905007-01	2
Chinosol/Anzag	Ethacridine lactate monohydr...	2112A-02196	1
Fagron	Ethacridine lactate monohydr...	2405210013	1
Euro OTC	Ethacridine lactate monohydr...	2905007V-03	2
Dermapharm	Ethacridine lactate monohydr...	130201	5
E+J, 28.09.2016	Ethacridine lactate monohydr...	141101	2
Dermapharm	Ethacridine lactate monohydr...	111201	7
Dermopharm	Ethacridine lactate monohydr...	141101	1
Phoenix	Ethacridine lactate monohydr...	100201	1
Finze	Ethacridine lactate monohydr...	90601	1
Caelo	Ethacridine lactate monohydr...	15/214/R	1
Anzag	Ethacridine lactate monohydr...	111201	1
Phönix	Ethacridine lactate monohydr...	111201	1
Caelo	Ethacridine lactate monohydr...	12149514	1
Dermopharm	Ethacridine lactate monohydr...	130201	1
Caelo	Ethacridine lactate monohydr...	15438007	1

- 55 911 spectra from 335 *Apo-Ident* customers from a total of 20 573 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ethacridine lactate monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethacridine lactate monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	60	0	81 288
Type C	0	66	24	55 911

The substance/substance group *Ethacridine lactate monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	73.3333 % (> 70.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20750	21265	9.47	28.20
21265	21265	0.00	28.06
21636	21265	6.10	28.18
22500	21265	13.49	27.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ethinyl estradiol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20950-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethinyl estradiol; Aethinyloestradiolum; Ethinylestradiolum

Special notes

When selecting the *Ethinyl estradiol* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethinyl estradiol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethinyl estradiol	13I09-N04	20950	40	1402058
Fagron	Ethinyl estradiol	14E15-B03-296049	21705	40	1507109
Fagron	Ethinyl estradiol	14E15-B03-310270	21916	40	20140708
Fagron	Ethinyl estradiol	14E15-B03-310270	21958	40	20140708
Fagron	Ethinyl estradiol	14E15-B03-296049	21705SI	36	1507109
Fagron	Ethinyl estradiol	14E15-B03-310270	21916SI	40	20140708
Fagron	Ethinyl estradiol	14E15-B03-310270	21958SI	28	20140708

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 264 spectra of 7 reference samples from the substance/substance group *Ethinyl estradiol*. These samples are listed above in the [calibration samples](#) section.
- 75 614 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 110 spectra of 6 reference samples from the substance/substance group *Ethinyl estradiol*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethinyl estradiol	14E15-B03-296049	21705 [†]	15
Fagron	Ethinyl estradiol	14E15-B03-310270	21916 [†]	20
Fagron	Ethinyl estradiol	14E15-B03-310270	21958 [†]	20
Fagron	Ethinyl estradiol	14E15-B03-296049	21705SI [†]	20
Fagron	Ethinyl estradiol	14E15-B03-310270	21916SI [†]	20
Fagron	Ethinyl estradiol	14E15-B03-310270	21958SI [†]	15

- 81 238 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 5 batches from the substance/substance group *Ethinyl estradiol*.

[†]These spectra were recorded from 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
Fagron	Ethinyl estradiol	13I09-N04	1
Caelo	Ethinyl estradiol	130909	1
Fagron	Ethinyl estradiol	14e15b03296049	1
Fagron	Ethinyl estradiol	84100720	1
Fagron	Ethinyl estradiol	12D19-N04	2

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ethinyl estradiol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethinyl estradiol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	264	0	75 614
Type B	0	110	0	81 238
Type C	0	5	1	55 995

The substance/substance group *Ethinyl estradiol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7273 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.5455 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20950	20950	0.00	26.39
21705	21705	0.00	21.81
21916	21705	9.78	21.00
21958	21705	4.59	25.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ethyl hydrogen fumarate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21575-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethyl hydrogen fumarate; Ethylis Hydrogenofumaras

Special notes

When selecting the *Ethyl hydrogen fumarate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethyl hydrogen fumarate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethyl hydrogen f...	14C12-B07-292760	21575	40	1410436
Fagron	Ethyl hydrogen f...	14C12-B07-292760	21724	40	20140417

Validation samples

A total of 213 227 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 *Ethyl hydrogen fumarate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Ethyl hydrogen fumarate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethyl hydrogen fumarate	14C12-B07-292760	21575 [†]	20
Fagron	Ethyl hydrogen fumarate	14C12-B07-292760	21724 [†]	20

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ethyl hydrogen fumarate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Ethyl hydrogen fumarate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethyl hydrogen fumarate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Ethyl hydrogen fumarate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21575	21575	0.00	59.99
21724	21575	2.55	58.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ethyl hydrogen fumarate calcium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21532-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethyl hydrogen fumarate calcium; Calcii ethylhydrogenfumaras; Calcii ethylhydrogenofumaras

Special notes

When selecting the *Ethyl hydrogen fumarate calcium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethyl hydrogen fumarate calcium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethyl hydrogen f...	13B25-N08	21532	40	1411090
Euro OTC	Ethyl hydrogen f...	1310029-01	21562	40	20131126
Euro OTC	Ethyl hydrogen f...	1306012-01	21641	40	1505456
Euro OTC	Ethyl hydrogen f...	1510005	21938	40	20151030*
Euro OTC	Ethyl hydrogen f...	1601011	22294	40	20160114*

Validation samples

A total of 213 227 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 *Ethyl hydrogen fumarate calcium*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 112 spectra of 6 reference samples from the substance/substance group *Ethyl hydrogen fumarate calcium*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethyl hydrogen fumarate calc...	13B25-N08	21532 [†]	20
Euro OTC	Ethyl hydrogen fumarate calc...	1310029-01	21562 [†]	20
Euro OTC	Ethyl hydrogen fumarate calc...	1306012-01	21641 [†]	20
Euro OTC	Ethyl hydrogen fumarate calc...	1510005	21938 [†]	20
Euro OTC	Ethyl hydrogen fumarate calc...	1601011	22294 [†]	20
Euro OTC	Ethyl hydrogen fumarate calc...	1510005-01	not required	12

- 81 236 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ethyl hydrogen fumarate calcium*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ethyl hydrogen fumarate calcium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethyl hydrogen fumarate calcium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	112	0	81 236
Type C	0	0	0	56 001

The substance/substance group *Ethyl hydrogen fumarate calcium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.6429 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21532	21532	0.00	50.73
21562	21641	13.60	36.83
21641	21641	0.00	23.13
21938	21938	0.00	57.50
22294	22294	0.00	58.91

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ethyl hydrogen fumarate magnesium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21533-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ethyl hydrogen fumarate magnesium; Magnesii ethylhydrogenofumaras

Special notes

When selecting the *Ethyl hydrogen fumarate magnesium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ethyl hydrogen fumarate magnesium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ethyl hydrogen f...	13G10-N01	21533	40	1411091
Euro OTC	Ethyl hydrogen f...	1306014-01	21642	40	20130805
Euro OTC	Ethyl hydrogen f...	1510006	21937	40	20151030*
Euro OTC	Ethyl hydrogen f...	1601010	22290	40	20160114*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ethyl hydrogen fumarate magnesium*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 126 spectra of 6 reference samples from the substance/substance group *Ethyl hydrogen fumarate magnesium*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ethyl hydrogen fumarate magn...	13G10-N01	21533 [†]	20
Euro OTC	Ethyl hydrogen fumarate magn...	1306014-01	21642 [†]	20
Euro OTC	Ethyl hydrogen fumarate magn...	1510006	21937 [†]	20
Euro OTC	Ethyl hydrogen fumarate magn...	1601010	22290 [†]	20
Euro OTC	Ethyl hydrogen fumarate magn...	1510006-01	23008	40
Fagron	Ethyl hydrogen fumarate magn...	14H27-B04-299502	not required	6

- 81 222 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ethyl hydrogen fumarate magnesium*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ethyl hydrogen fumarate magnesium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ethyl hydrogen fumarate magnesium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	126	0	81 222
Type C	0	0	0	56 001

The substance/substance group *Ethyl hydrogen fumarate magnesium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.2381 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21533	21533	0.00	33.77
21642	21533	23.97	40.37
21937	21937	0.00	27.55
22290	22290	0.00	30.28

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Fampridine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20902-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fampridine; Fampridinum

Special notes

When selecting the *Fampridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fampridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Fampridine	13G26-N06	20902	40	1402686
Fagron	Fampridine	14D11-B06-293750	21541	40	20140113
Fagron	Fampridine	16D11-B07-318220	22491	40	AR-16-FG-011566-01
Caelo	Fampridine	16276001	22881	40	20161024
Fagron	Fampridine	16E25-B03-324097	22894	40	20160609
Caelo	Fampridine	16276001	22905	40	20161024

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Fampridine*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Fampridine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Fampridine	14D11-B06-293750	21541 [†]	20
Fagron	Fampridine	16E25-B03-324097	22945	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Fampridine*.

Supplier	Substance	Batch	Spectra
Fagron	Fampridine	14D11-B06-296110	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
Fagron	Fampridine	16D11-B07	1
Fagron	Fampridine	13C07-B02-289395	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fampridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fampridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	60	0	81 288
Type C	0	3	0	55 998

The substance/substance group *Fampridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20902	20902	0.00	65.76
21541	20902	5.56	66.32

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22491	22491	0.00	63.40
22881	22491	15.05	65.09
22894	22491	7.45	65.07
22905	22491	14.72	65.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Finasteride (form III)**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20955-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Finasteride (form III); Finasteridum (Form III)

Special notes

When selecting the *Finasteride (form III)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Finasteride (form III)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Finasteride (for...	13I03-N01	20955	40	1411272
Euro OTC	Finasteride (for...	1403016-01	21626	40	1506004
Fagron	Finasteride (for...	14A16-B40-295980	21742	40	20140317
Euro OTC	Finasteride (for...	1403016-02	21750	40	20140505
Euro OTC	Finasteride (for...	1605020	22565	40	20160613*
Euro OTC	Finasteride (for...	1610012	22856	40	20161116*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Finasteride (for...	14A16-B40-295980	21742SI	30	20140317
Euro OTC	Finasteride (for...	1403016-02	21750SI	36	20140505
Euro OTC	Finasteride (for...	1605020	22565SI	40	20160613*
Euro OTC	Finasteride (for...	1610012	22856SI	33	20161116*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 379 spectra of 10 reference samples from the substance/substance group *Finasteride (form III)*. These samples are listed above in the [calibration samples](#) section.
- 75 499 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 290 spectra of 10 reference samples from the substance/substance group *Finasteride (form III)*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Finasteride (form III)	12A04-N09	20589	40
Euro OTC	Finasteride (form III)	1403016-01	21626 [†]	20
Fagron	Finasteride (form III)	14A16-B40-295980	21742 [†]	20
Euro OTC	Finasteride (form III)	1403016-02	21750 [†]	20
Fagron	Finasteride (form III)	15J15-B02-320084	22594	40
Fagron	Finasteride (form III)	15J15-B02-320084	22595	40
Fagron	Finasteride (form III)	14A16-B40-295980	21742SI [†]	15
Euro OTC	Finasteride (form III)	1403016-02	21750SI [†]	15
Fagron	Finasteride (form III)	15J15-B02-320084	22594SI	40
Fagron	Finasteride (form III)	15J15-B02-320084	22595SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 058 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 batches from the substance/substance group *Finasteride (form III)*.

Supplier	Substance	Batch	Spectra
Fagron	Finasteride (form III)	17011303	1
FRagron	Finasteride (form III)	13I03-N01	2
Fagron	Finasteride (form III)	14111305	1
Euro OTC	Finasteride (form III)	1403016-02	1
Euro OTC	Finasteride (form III)	1411008-01	1
Fagron	Finasteride (form III)	14L23-B02-306981	1
Shandong Northwest Manu...	Finasteride (form III)	FNA160604	1

- 55 993 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Finasteride (form III)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Finasteride (form III)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	379	0	75 499
Type B	0	290	0	81 058
Type C	0	7	1	55 993

The substance/substance group *Finasteride (form III)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.4169 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.9310 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20955	20955	0.00	32.76
21626	21626	0.00	35.22
21742	22565	9.78	42.65
21750	22565	8.74	40.06
22565	22565	0.00	36.28
22856	22856	0.00	35.96

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Fluconazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22360-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fluconazole; Fluconazolum

Special notes

When selecting the *Fluconazole* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fluconazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Audor	Fluconazole	AP061502911F	22360	40	AR-16-FG-008733-01
Audor	Fluconazole	AP061502911F	22596	40	AR-16-FG-014225-01

Validation samples

A total of 213 227 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 *Fluconazole*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 5 reference samples from the substance/substance group *Fluconazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Audor Pharma	Fluconazole	AP061502911F	22360 [†]	20
Audor Pharma	Fluconazole	AP061502911F	22738	40
Audor Pharma	Fluconazole	AP061502911F	22360SI	60
Audor Pharma	Fluconazole	AP061502911F	22596SI	40
Audor Pharma	Fluconazole	AP061502911F	22738SI	40

- 81 148 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Fluconazole*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fluconazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fluconazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 798
Type B	0	86	114	81 148
Type C	0	0	0	56 001

The substance/substance group *Fluconazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	43.0000 % (> 41.5000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22360	22360	0.00	31.75
22596	22596	0.00	28.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Fluocinolonacetonid, micronized
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	21031-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Fluocinolonacetonid, micronized; Fluocinoloni acetonidum micron.; Fluocinolonom acetonatum micron.

Special notes

When selecting the *Fluocinolonacetonid, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fluocinolonacetonid, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Fluocinolonaceto...	2804013E-01	21031	40	1404008
Euro OTC	Fluocinolonaceto...	2804013E-01	21077	40	20121206
Caelo	Fluocinolonaceto...	12035003	21756	40	20120321
Euro OTC	Fluocinolonaceto...	2804013E-01	21822	40	20121206
Fagron	Fluocinolonaceto...	14L19-B04-307101	22267	30	20150219

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Fluocinolonaacet...	162281	22637	40	20160907*
Caelo	Fluocinolonaacet...	12035003	21756SI	33	20120321
Euro OTC	Fluocinolonaacet...	2804013E-01	21822SI	40	20121206
Fagron	Fluocinolonaacet...	14L19-B04-307101	22267SI	30	20150219
Caelo	Fluocinolonaacet...	162281	22637SI	30	20160907*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 363 spectra of 10 reference samples from the substance/substance group *Fluocinolonaacetoniid, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 515 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 251 spectra of 9 reference samples from the substance/substance group *Fluocinolonaacetoniid, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Fluocinolonaacetoniid, microni...	2804013V-03	20243	40
Caelo	Fluocinolonaacetoniid, microni...	12035003	21756 [†]	20
Euro OTC	Fluocinolonaacetoniid, microni...	2804013E-01	21822 [†]	20
Euro OTC	Fluocinolonaacetoniid, microni...	2804013E-01	21823	60
Fagron	Fluocinolonaacetoniid, microni...	14L19-B04-307101	22267 [†]	15
Caelo	Fluocinolonaacetoniid, microni...	12035003	21756SI [†]	15
Euro OTC	Fluocinolonaacetoniid, microni...	2804013E-01	21822SI [†]	20
Euro OTC	Fluocinolonaacetoniid, microni...	2804013E-01	21823SI	46
Fagron	Fluocinolonaacetoniid, microni...	14L19-B04-307101	22267SI [†]	15

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 097 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 5 *Apo-Ident* customers from 12 batches from the substance/substance group *Fluocinolone acetonide, micronized*.

Supplier	Substance	Batch	Spectra
Fargon/Noweda	Fluocinolone acetonide, micronized...	13L13-B35	1
Fargon	Fluocinolone acetonide, micronized...	13L30-B35-295489	1
Euro OTC	Fluocinolone acetonide, micronized...	1408022-01	2
Fargon	Fluocinolone acetonide, micronized...	14L19-B04	3
Fargon/Kehr	Fluocinolone acetonide, micronized...	14L-19-B04	1
Fargon	Fluocinolone acetonide, micronized...	14L19-B04-317248	1
Euro OTC	Fluocinolone acetonide, micronized...	2804013E-01	1
Fargon	Fluocinolone acetonide, micronized...	14L19-B04-615699	1
Euro OTC	Fluocinolone acetonide, micronized...	2840013E-02	1
Fargon	Fluocinolone acetonide, micronized...	13E22-N10	1
Caelo	Fluocinolone acetonide, micronized...	2804013V-03	1
Caelo	Fluocinolone acetonide, micronized...	12035003	2

- 55 985 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fluocinolone acetonide, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fluocinolone acetonide, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	363	0	75 515
Type B	0	250	1	81 097
Type C	0	14	2	55 985

The substance/substance group *Fluocinolone acetonide, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.3471 %)
Type B	100.0000 % (> 99.9853 %)	99.6016 % (> 98.4064 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21031	21031	0.00	35.11
21077	21031	1.90	35.53
21756	21031	20.07	42.32
21822	21031	17.55	42.01
22267	21031	16.23	39.81
22637	22637	0.00	42.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Folic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20370-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Folic acid; Acidum folicum

Special notes

When selecting the *Folic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Folic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Folic acid	10F03-N13	20370	40	AR-12-FG-008059-01
Fagron	Folic acid	12G17-N05	20767	40	20120727
Euro OTC	Folic acid	1401005-01	21288	40	20140131
Euro OTC	Folic acid	1508024	21891	40	20150902*
Euro OTC	Folic acid	1604036	22554	40	20160429*
Euro OTC	Folic acid	1611009	22868	40	20161201*

Validation samples

A total of 213 227 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 *Folic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Folic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Folic acid	1508024	21891 [†]	20
Euro OTC	Folic acid	1608030	22818	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 batches from the substance/substance group *Folic acid*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Folic acid	13g16-n02	1
Fagron	Folic acid	10F03-N13	1
Euro OTC	Folic acid	1307041-01	1
Fagron	Folic acid	13G16-N02	4
Fagron	Folic acid	13A11-N01	1
Euro OTC	Folic acid	1401005-01	2
Fagron	Folic acid	UT11110182	1

- 55 990 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Folic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Folic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	230	10	75 638
Type B	0	60	0	81 288
Type C	0	11	0	55 990

The substance/substance group *Folic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.8333 % (> 94.5833 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20370	20370	0.00	56.53
20767	21891	1.88	70.61
21288	21891	8.31	70.97
21891	21891	0.00	70.08
22554	22554	0.00	69.16
22868	22868	0.00	73.06

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Fructose**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20074-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fructose; Fructosum; Laevulosum

Special notes

When selecting the *Fructose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fructose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Fructose	09302705	20074	30	F 2009 000 981
Euro OTC	Fructose	1212015-01	21281	40	20130111
Euro OTC	Fructose	1509037	21934	40	20151027*
Euro OTC	Fructose	1512009	22292	40	20160113*
Caelo	Fructose	160667	22481	40	20160425*
Caelo	Fructose	15084311	22490	40	20150316
Euro OTC	Fructose	1701049	22986	40	20170213*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Fructose*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 196 spectra of 7 reference samples from the substance/substance group *Fructose*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Fructose	9302705	20074 [†]	15
Euro OTC	Fructose	1509037	21934 [†]	20
Euro OTC	Fructose	1512009	22292 [†]	20
Caelo	Fructose	160667	22481 [†]	20
Euro OTC	Fructose	1604024	22547	41
Caelo	Fructose	15271213	22583	40
Euro OTC	Fructose	1607030	22693	40

- 81 152 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 267 spectra from 72 *Apo-Ident* customers from 128 batches from the substance/substance group *Fructose*.

Supplier	Substance	Batch	Spectra
Caelo	Fructose	14096205	4
Phoenix Goettin	Fructose	14E01-B04-293505	2
Euro OTC	Fructose	1509037-01	2
Caelo	Fructose	11258628	2
Euro OTC	Fructose	1201017-01	2
Caelo	Fructose	15A16-B07-305241	1
Jenne	Fructose	1607030-01	2
phönix,29.10.12	Fructose	1205022-01	1
Fagron	Fructose	7K21-N12	1
Euro OTC	Fructose	1205022-01	1
EuRho	Fructose	1212015-01	1
Caelo	Fructose	12132317	2
Caelo	Fructose	12132325	3
Fagron	Fructose	12K28-N06	1
Caelo	Fructose	1081501	1
Caelo	Fructose	1309213394	1
Caelo	Fructose	5061503	1
Fagron	Fructose	508Q-03394	1
Synopharm	Fructose	202A052	1
Fagron	Fructose	516Q-03394	1
Caelo	Fructose	7051304	1
Lihn/Reformhaus	Fructose	713E-03394	2
Caelo	Fructose	7111401	1
Caelo	Fructose	9031504	1
Caelo	Fructose	10051401	1
Caelo	Fructose	10071201	1
Caelo	Fructose	10381011	1
Caelo	Fructose	10381013	1
Anzag	Fructose	10381013	1
Gehe	Fructose	11/07-N08	1
Caelo	Fructose	11071201	1
Caelo	Fructose	1114A03394	1
Caelo	Fructose	11258611	1
Caelo	Fructose	11258614	1
Caelo	Fructose	11258627	3
anzag am 12.06.2012	Fructose	1201017-01	1
Noweda	Fructose	1205022-01	1
Euro OTC	Fructose	1209010-01	3
Euro OTC	Fructose	121201-01pzn	2
Euro OTC	Fructose	1212015-01	5
euroct/gehe	Fructose	1212015-01	1
Anzag 05.03.13	Fructose	12132301	1
Ichthyol, Noweda	Fructose	12132301	1
Caelo	Fructose	12132305	6
Caelo	Fructose	12132301	1
Caelo	Fructose	12132309	2
Caelo	Fructose	12132313	3
Caelo	Fructose	12132310	1
Caelo	Fructose	12132314	5
Caelo	Fructose	12132322	3
Caelo	Fructose	12132320	1
Caelo	Fructose	121e29-n08	1
Fagron	Fructose	12E29-N08	4
VDL	Fructose	12A26-N04	1
Fagron	Fructose	12A26-N04	1
Gehe	Fructose	12B02-N07	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Fructose	12E29-N08	4
Fagron	Fructose	12H01-N03	3
Gehe	Fructose	12K28-N06	1
Phönix	Fructose	12K28-N06	1
Euro OTC	Fructose	1307022-01	5
Caelo	Fructose	13021304	1
Caelo	Fructose	13098902	3
Caelo	Fructose	13098901	1
Phoenix 22.12.14	Fructose	1307022-01	1
Fagron	Fructose	13098906	1
Caelo	Fructose	13098906	4
Caelo	Fructose	13098904	1
Caelo	Fructose	13098909	1
Caelo	Fructose	13098911	1
GEHE 17.06.2014	Fructose	13098913	1
Caelo	Fructose	13098914	3
Caelo	Fructose	13098913	1
Caelo	Fructose	13098915	1
Caelo	Fructose	13098917	3
Caelo	Fructose	13098918	1
Caelo	Fructose	13098922	1
Caelo	Fructose	13098922	1
Fagron	Fructose	1312A-03394	1
Fagron	Fructose	13A28-N01	8
Phönix	Fructose	13A28-N01	2
13.08.13	Fructose	13A28-N01	1
fargon	Fructose	13C25-N03	1
Fagron	Fructose	13C25-N03	4
Alliance Health 13.02.2...	Fructose	13C25-N03	1
Fagron	Fructose	13E27-N07	2
Fagron	Fructose	13J18-B06	2
Gehe	Fructose	13J18-B06-286896	1
Fagron	Fructose	13j18B06286896	1
Euro OTC	Fructose	1401004-01	6
Caelo	Fructose	13J18-B06-286896	1
Fagron	Fructose	13J18-B06-286899	1
Phoenix 22.12.14	Fructose	1401004-01	1
Caelo	Fructose	14096201	4
Caelo	Fructose	14096203	1
Caelo	Fructose	14096211	1
Caelo	Fructose	14096208	2
Caelo	Fructose	14096219	4
Caelo	Fructose	14096223	5
Euro OTC	Fructose	1410009-01	4
Euro OTC	Fructose	141000901	3
Caelo	Fructose	14305203	2
Caelo	Fructose	14305204	1
Fagron	Fructose	14E01-B04	2
Fagron	Fructose	14E01-B04-293505	3
Jenne	Fructose	14A16-B07	1
Fagron	Fructose	14E01-B04-29350	1
Gehe	Fructose	14E01-B04-293506	2
Fagron	Fructose	14E01-B04-293506	2
Fagron	Fructose	14E01-B04-297098	1
Fagron	Fructose	14E1-B04-293506	1
Fagron	Fructose	14E01B04293506	1
Fagron	Fructose	14K17-B99	2
Allianz Healthcare 17.0...	Fructose	14K17-B99-300913	4
Fagron	Fructose	15/21-B01	1
Euro OTC	Fructose	1503045-01	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Fructose	15084305	1
Caelo	Fructose	15084301	1
Caelo	Fructose	15084312	1
Euro OTC	Fructose	1512009-01	2
Caelo	Fructose	152711201	1
Caelo	Fructose	15271205	1
Caelo	Fructose	15271209	1
Caelo	Fructose	15271213	3
Gatt Koller	Fructose	1544/05141914	1
Jenne	Fructose	15A16-B07	1
Fagron	Fructose	15A16-B07-305241	1
Caelo	Fructose	15A16-B07	1
Phoenix	Fructose	15I21-B01	1
Ebert & Jacobi 08.08.16	Fructose	1604024-01	1
Euro OTC	Fructose	1604024-01	1
Caelo	Fructose	16066106	1
Fagron	Fructose	3014Q-03394	1
Caelo	Fructose	31031401	1
Caelo	Fructose	18021501	1
Gatt-Koller / Phoenix	Fructose	3156/0813	1
Caelo	Fructose	21051303	1
Caelo	Fructose	20081402	1
Caelo	Fructose	3313U-03394	1
Alliance Health 12.09.2...	Fructose	FR1336122	3
Fagron	Fructose	FR1413072	1
Fagron	Fructose	FR1443072	1
Caelo	Fructose	Fructose1	1
Gehe	Fructose	K43298821	1
Fagron	Fructose	K43298821	2
Caelo	Fructose	Fructose2	1
Fagron	Fructose	K43537721	1
Sanacorp	Fructose	K43537721	1
Caelo	Fructose	14305206	1
Caelo	Fructose	13A28-N01	1
Caelo	Fructose	14305201	1
Caelo	Fructose	15084308	1
Caelo	Fructose	15084311	1
Caelo	Fructose	16066103	1
Fagron	Fructose	13J18-B06-286896	1
Caelo	Fructose	11I07-N06	1
Fagron	Fructose	1107-N06	1
Beiersdorf	Fructose	14096208	1

- 55 734 spectra from 335 *Apo-Ident* customers from a total of 20 483 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fructose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fructose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table

breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	196	0	81 152
Type C	0	267	0	55 734

The substance/substance group *Fructose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.9388 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 97.7528 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20074	20074	0.00	33.89
21281	22986	5.80	29.40
21934	21934	0.00	28.99
22292	22292	0.00	33.41
22481	22481	0.00	30.58
22490	22292	3.49	31.55
22986	22986	0.00	30.98

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Furosemide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20944-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Furosemide; Furosemidum

Special notes

When selecting the *Furosemide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Furosemide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Furosemide	13A22-N08	20944	40	1401379
Fagron	Furosemide	14K10-B02-301746	21819	40	20141215

Validation samples

A total of 213 227 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 *Furosemide*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Furosemide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Furosemide	11B18-N04	20241	40
Fagron	Furosemide	14K10-B02-301746	21819 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 *Apo-Ident* customers from 11 batches from the substance/substance group *Furosemide*.

Supplier	Substance	Batch	Spectra
Fagron	Furosemide	11K21-N26	1
Fagron	Furosemide	1095H2RI	1
IPCA/Noweda	Furosemide	11D29-N08	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
Alliance Healthcare/Hed...	Furosemide	12/13-N06	1
Fagron	Furosemide	12I13-No6	1
Fagron	Furosemide	12A18-N03	1
Fagron	Furosemide	13A22-N08	3
Phönix	Furosemide	12a18-n03	1
Fagron	Furosemide	13E28-B40	2
Fagron	Furosemide	13E28-B40-295538	1
Fagron	Furosemide	13E28-B40-289433	1

- 55 987 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Furosemide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Furosemide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	14	0	55 987

The substance/substance group *Furosemide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20944	20944	0.00	67.83
21819	20944	6.08	66.11

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Fusidic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20780-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Fusidic acid; Acidum fusidicum; Acidum fusidinicum

Special notes

When selecting the *Fusidic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Fusidic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Fusidic acid	12G04-N01	20780	40	1401162
Fagron	Fusidic acid	13L13-B01-289513	21733	40	20140113
Fagron	Fusidic acid	14E01-B08-299791	21897	40	20140605

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Fusidic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Fusidic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Fusidic acid	13L13-B01-289513	21733 [†]	20
Fagron	Fusidic acid	14E01-B08-299791	21897 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 batches from the substance/substance group *Fusidic acid*.

Supplier	Substance	Batch	Spectra
Fagron	Fusidic acid	4113U-07034	1
Fagron	Fusidic acid	13L13-B01-289513	1
Fagron	Fusidic acid	14E01-B08-299791	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
Fagron	Fusidic acid	116E-03682	1
Ebert 24.08.16	Fusidic acid	1510-B02319452	1
Fagron	Fusidic acid	1510-B02319231	1
Fagron	Fusidic acid	13A07-N10	2
Fagron	Fusidic acid	12G04-No1	1
Fagron	Fusidic acid	12B23-N03	1
Fagron	Fusidic acid	13H19-N05	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Fusidic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Fusidic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	12	0	55 989

The substance/substance group *Fusidic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20780	20780	0.00	26.42
21733	20780	5.52	24.76
21897	20780	13.32	24.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Gelatine, white**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20206-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gelatine, white; Gelatina alba

Special notes

When selecting the *Gelatine, white* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Gelatine, white*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Gelatine, white	10051107	20206	40	AR-12-FG-002699-01
Caelo	Gelatine, white	11334025	20898	40	20111214
Caelo	Gelatine, white	15320504	22499	40	AR-16-FG-014461-01
Caelo	Gelatine, white	15320504	22582	40	AR-16-FG-011564-01

Validation samples

A total of 213 227 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 *Gelatine, white*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 5 spectra of 1 reference samples from the substance/substance group *Gelatine, white*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Gelatine, white	15320504	22582 [†]	5

- 81 343 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 22 spectra from 15 *Apo-Ident* customers from 16 batches from the substance/substance group *Gelatine, white*.

Supplier	Substance	Batch	Spectra
EuRho / 20	Gelatine, white	1106021-01	1
Caelo	Gelatine, white	14130901	1
Caelo	Gelatine, white	15084801	1
Caelo	Gelatine, white	14130912	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Gelatine, white	15084806	1
Caelo	Gelatine, white	15320504	1
Caelo	Gelatine, white	11019308	1
Caelo	Gelatine, white	11019319	1
Caelo	Gelatine, white	11019322	1
Euro OTC	Gelatine, white	1106021-01	2
Caelo	Gelatine, white	11314516	1
Caelo	Gelatine, white	11334020	1
Caelo	Gelatine, white	11334025	3
Phönix 13.05.2013	Gelatine, white	12332564	1
Caelo	Gelatine, white	12354401	1
Caelo	Gelatine, white	12354507	3
Caelo	Gelatine, white	4110I-01578	1

- 55 979 spectra from 335 *Apo-Ident* customers from a total of 20 597 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gelatine, white* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gelatine, white* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	5	0	81 343
Type C	0	21	1	55 979

The substance/substance group *Gelatine, white* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9857 %)	n/a (n/a)
Type C	100.0000 % (> 99.8622 %)	95.4545 % (> 81.8182 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20206	20206	0.00	17.63
20898	22582	6.49	17.81
22499	22499	0.00	15.74
22582	22582	0.00	16.09

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Gentamicin sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20640-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gentamicin sulfate; Gentamicin sulphate; Gentamicini sulfas; Gentamycinum sulfuricum

Special notes

When selecting the *Gentamicin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Gentamicin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Gentamicin sulfate	11113309	20640	40	20110505
Fagron	Gentamicin sulfate	12B21-N02	20661	40	1411075
Euro OTC	Gentamicin sulfate	1305047-01	21081	40	20130919
Fagron	Gentamicin sulfate	13I19-B05-286565	21578	40	pending
Caelo	Gentamicin sulfate	13205003	21580	40	20130723
Euro OTC	Gentamicin sulfate	1305047-03	21582	40	1411076

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Gentamicin sulfate	14E08-B03-294848	21684	40	20140616
Euro OTC	Gentamicin sulfate	1305047-03	21697	30	AR-15-FG-012403-01
Euro OTC	Gentamicin sulfate	1506016	21837	40	0000010321
Caelo	Gentamicin sulfate	14353504	22604	40	20150119
Euro OTC	Gentamicin sulfate	1610036	22857	40	20161124*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 430 spectra of 11 reference samples from the substance/substance group *Gentamicin sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 448 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 545 spectra of 15 reference samples from the substance/substance group *Gentamicin sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Gentamicin sulfate	73402189	20008	50
Caelo	Gentamicin sulfate	9115106	20108	40
Euro OTC	Gentamicin sulfate	2911034-01	20223	40
zu erfassen	Gentamicin sulfate	pending	21016	20
Fagron	Gentamicin sulfate	13I19-B05-286565	21578 [†]	20
Caelo	Gentamicin sulfate	13205003	21580 [†]	20
Euro OTC	Gentamicin sulfate	1305047-03	21582 [†]	20
Fagron	Gentamicin sulfate	14E08-B03-294848	21684 [†]	20
Euro OTC	Gentamicin sulfate	1305047-03	21697 [†]	15
Euro OTC	Gentamicin sulfate	1506016	21837 [†]	20
Euro OTC	Gentamicin sulfate	1604054	22568	40
Fagron	Gentamicin sulfate	13I19-B05-286565	21578SI	60
Caelo	Gentamicin sulfate	13205003	21580SI	60
Fagron	Gentamicin sulfate	14E08-B03-294848	21684SI	60
Euro OTC	Gentamicin sulfate	1506016	21837SI	60

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 80 803 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 450 spectra from 197 *Apo-Ident* customers from 141 batches from the substance/substance group *Gentamicin sulfate*.

Supplier	Substance	Batch	Spectra
Caelo	Gentamicin sulfate	7011505	1
Euro OTC	Gentamicin sulfate	1205021-02	18
Caelo	Gentamicin sulfate	12146602	8
Caelo	Gentamicin sulfate	12146604	5
Fagron	Gentamicin sulfate	12D26-N05	11
Fujian Fukang Pharmaceu. . .	Gentamicin sulfate	12G04-N16	2
Fagron	Gentamicin sulfate	13/19-B05-286568	1
PHOENIX 10.03.2014	Gentamicin sulfate	1305047	1
Gehe am 24.2.14	Gentamicin sulfate	1305047-01	1
Noweda	Gentamicin sulfate	1305005	1
Euro OTC	Gentamicin sulfate	1305047-01	10
Euro OTC	Gentamicin sulfate	1305047-03	11
Euro OTC	Gentamicin sulfate	130504703	2
Euroo/Phoenix	Gentamicin sulfate	1305047-03	1
Anzag	Gentamicin sulfate	1305047-03	1
Phoenix	Gentamicin sulfate	1305047-03	1
Caelo	Gentamicin sulfate	1305047-03	1
Sanacorp	Gentamicin sulfate	1305047-03	1
Caelo	Gentamicin sulfate	13189606	5
Herbasinica	Gentamicin sulfate	13189608	1
Caelo	Gentamicin sulfate	13189608	4
Sanacorp	Gentamicin sulfate	13189608	1
Phönix	Gentamicin sulfate	13189611	1
Caelo	Gentamicin sulfate	13189611	10
Phönix Gotha	Gentamicin sulfate	13189611	1
Noweda	Gentamicin sulfate	13189611	1
Caelo	Gentamicin sulfate	13189612	11
Noweda	Gentamicin sulfate	13189612	1
Caelo	Gentamicin sulfate	13189613	1
Fagron	Gentamicin sulfate	1319-B05-286565	1
Caelo	Gentamicin sulfate	13189614	1
Caelo	Gentamicin sulfate	13205003	6
Caelo	Gentamicin sulfate	13205004	1
Caelo	Gentamicin sulfate	13205005	9
Caelo	Gentamicin sulfate	13205006	4
AHD	Gentamicin sulfate	13205005	2
Fagron	Gentamicin sulfate	13D24-N05	10
Caelo	Gentamicin sulfate	13205007	1
Fagron	Gentamicin sulfate	13f13-N01	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
Fagron	Gentamicin sulfate	13I19-B05	1
Caelo	Gentamicin sulfate	13I19-B05-286565	1
Euro OTC	Gentamicin sulfate	1407024-01	2
Euro OTC	Gentamicin sulfate	1407024	1
Euro	Gentamicin sulfate	1407024-01	1
Euro OTC	Gentamicin sulfate	140702403	1
Euro OTC	Gentamicin sulfate	1407024-03	1
Euro OTC	Gentamicin sulfate	1407024-4	1
Euro OTC	Gentamicin sulfate	140702404	1
Euro OTC	Gentamicin sulfate	1407024-04	4
Noweda	Gentamicin sulfate	140702404	1
Caelo	Gentamicin sulfate	14353502	2
Caelo	Gentamicin sulfate	143533504	1
Caelo	Gentamicin sulfate	14353503	8
Caelo	Gentamicin sulfate	14353504	5
Noweda	Gentamicin sulfate	14353504	1
Fagron	Gentamicin sulfate	14A30-B04	2
Caelo	Gentamicin sulfate	14353505	2
Fagron	Gentamicin sulfate	14A30-B04-290861	3
Fujian Fukang Pharmacea...	Gentamicin sulfate	14A30-B04-290861	1
Fagron	Gentamicin sulfate	14E08-B03	1
Fagron	Gentamicin sulfate	14E08-B03-294835	1
Fagron	Gentamicin sulfate	14E08-B03-294841	2
Caelo	Gentamicin sulfate	14E08-B03-294841	1
Fagron	Gentamicin sulfate	14E08-B03-294848	3
Fagron	Gentamicin sulfate	14e08b03300619	1
Fujian Fukang Pharmacea...	Gentamicin sulfate	14E08-B03-300619	1
Fagron	Gentamicin sulfate	14K28-B06	1
Fagron	Gentamicin sulfate	14E08-B03-300619	1
Caelo	Gentamicin sulfate	14K28-B06-303636	1
Fagron	Gentamicin sulfate	14K28-B06-301951	1
Yantai Justaware Pharma...	Gentamicin sulfate	14K28-B06	1
Fagron	Gentamicin sulfate	14K28-B06-303640	1
Caelo	Gentamicin sulfate	14K28-B06-303646	3
Fagron	Gentamicin sulfate	14k28-b06-303640	1
Fagron	Gentamicin sulfate	14K28-B06-303646	2
Fagron	Gentamicin sulfate	14K28B06303646	2
Euro OTC	Gentamicin sulfate	1506016-01	4
Caelo	Gentamicin sulfate	1506016-01	2
Euro OTC	Gentamicin sulfate	1506016-02	12
Euro OTC	Gentamicin sulfate	150601602	1
Caelo	Gentamicin sulfate	15226501	7
Phoenix	Gentamicin sulfate	15226501	1
Caelo	Gentamicin sulfate	15226502	5
Phoenix	Gentamicin sulfate	15226502	1
PHÖNIX	Gentamicin sulfate	15226514	1
Caelo	Gentamicin sulfate	15258802	3
Caelo	Gentamicin sulfate	15258803	6
Fagron	Gentamicin sulfate	15B03-B07	1
Caelo	Gentamicin sulfate	15258810	3
Fagron	Gentamicin sulfate	15b03-b07-309482	1
Caelo	Gentamicin sulfate	15B03-B07-309482	1
Fagron	Gentamicin sulfate	15G29-B09-326632	1
Fagron	Gentamicin sulfate	15E04-B05-316255	2
Euro OTC	Gentamicin sulfate	16004054-01	1
Euro OTC	Gentamicin sulfate	1604054-01	2
Euro OTC	Gentamicin sulfate	16004054-02	1
Caelo	Gentamicin sulfate	4563125	1
Caelo	Gentamicin sulfate	1604054-01	1
Euro OTC	Gentamicin sulfate	1604054-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Gentamicin sulfate	17081502	1
Caelo	Gentamicin sulfate		2
Fagron	Gentamicin sulfate	FG1212646	1
Fagron	Gentamicin sulfate	11K21-N17	2
Fagron	Gentamicin sulfate	FG1305122	1
Euro OTC	Gentamicin sulfate	1205021-01	11
Caelo	Gentamicin sulfate	12G04-N16	2
Caelo	Gentamicin sulfate	1216602	1
Euro OTC	Gentamicin sulfate	FG11112482	1
Sanacorp	Gentamicin sulfate	13189606	1
Caelo	Gentamicin sulfate	13189607	11
Fagron	Gentamicin sulfate	13I19-B05-286568	1
Fagron	Gentamicin sulfate	14A30-B04-290858	1
EuRho	Gentamicin sulfate	1305047-01	1
Fagron	Gentamicin sulfate	11604054-01	1
Caelo	Gentamicin sulfate	1435303	1
Fagron	Gentamicin sulfate	14a30-b04-290858	1
Fagron	Gentamicin sulfate	14k28-B06-303640	1
Caesar&Loretz GmbH	Gentamicin sulfate	15226501	1
Caelo	Gentamicin sulfate	15226508	1
Fagron	Gentamicin sulfate	15803-B07-309482	1
Caelo	Gentamicin sulfate	3714I-01582	1
Caelo	Gentamicin sulfate	9115112	1
Euro OTC	Gentamicin sulfate	80616-2	1
Caelo	Gentamicin sulfate	100017814	1
Caelo	Gentamicin sulfate	10017820	1
Phönix Gotha	Gentamicin sulfate	10017817	1
Fagron	Gentamicin sulfate	10A29-N06	1
Fagron	Gentamicin sulfate	11/09N10	1
Fagron	Gentamicin sulfate	11/09-N10	1
Noweda	Gentamicin sulfate	1106016-01	1
Euro OTC	Gentamicin sulfate	1106016-01	5
Euro OTC	Gentamicin sulfate	1106016-02	3
Caelo	Gentamicin sulfate	1106016-01	1
Fagron	Gentamicin sulfate	1106016-01	1
Euro OTC	Gentamicin sulfate	1106016-03	3
Caelo	Gentamicin sulfate	1106016-03	1
Euro OTC	Gentamicin sulfate	110616-01	1
Caelo	Gentamicin sulfate	111113309	1
Caelo	Gentamicin sulfate	11113303	2
Caelo	Gentamicin sulfate	11113304	4
Caelo	Gentamicin sulfate	11113308	5
Phönix	Gentamicin sulfate	11113309	1
phönix, 19.11.2012	Gentamicin sulfate	1160616-03	1
Fagron	Gentamicin sulfate	11k21-n17	3
Großhandel	Gentamicin sulfate	11K21-N17	1
Sanacorp	Gentamicin sulfate	1205021	1
Gehe	Gentamicin sulfate	1205021-01	1
Bombastus	Gentamicin sulfate	1205021-01	1
Gehe	Gentamicin sulfate	1205021-02	1
Caelo	Gentamicin sulfate	1205021-02	3
Fagron	Gentamicin sulfate	1205021-02	3
Euro OTC	Gentamicin sulfate		1
phönix	Gentamicin sulfate	1214605	1
Anzag	Gentamicin sulfate	12146602	1
vdl	Gentamicin sulfate	12146602	1
Noweda	Gentamicin sulfate	12146602	1
Phönix	Gentamicin sulfate	12146602	1
Caelo	Gentamicin sulfate	12146605	6
Gehe	Gentamicin sulfate	12146604	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Gentamicin sulfate	12146605	1
Phönix Gotha	Gentamicin sulfate	12146611	1
Caelo	Gentamicin sulfate	12146611	12
Caelo	Gentamicin sulfate	12146612	4
Caelo	Gentamicin sulfate	12163204	5
Caelo	Gentamicin sulfate	12163206	1
Phönix Gotha	Gentamicin sulfate	12163207	1
Caelo	Gentamicin sulfate	12163207	4
Fagron	Gentamicin sulfate	1221-n02	1
Fagron	Gentamicin sulfate	12B21-N02	2
Caelo	Gentamicin sulfate	12163209	1
Anzag 06.09.2012	Gentamicin sulfate	12D26-N05	1
Phoenix	Gentamicin sulfate	12D26-N05	1
Fagron	Gentamicin sulfate	12D26N05	1
Fagron	Gentamicin sulfate	12D6-N05	1
Fagron	Gentamicin sulfate	12G04-N16	1
Fagron	Gentamicin sulfate	12g04-n16	1
Kehr	Gentamicin sulfate	12G04-N16	1
Fagron	Gentamicin sulfate	12117-no2	1
Alliance Healthcare	Gentamicin sulfate	12G04-N16	1
Euro OTC	Gentamicin sulfate	130504701	1
Caelo	Gentamicin sulfate	13091207	1
Caelo	Gentamicin sulfate	13189602	6
Phönix/Maros	Gentamicin sulfate	13189602	1
Caelo	Gentamicin sulfate	13189603	3
Fagron	Gentamicin sulfate	13189607	1
Noweda	Gentamicin sulfate	13189607	1
Caelo	Gentamicin sulfate	13D24-N05	1
Caelo	Gentamicin sulfate	1710I-01582	1
Fagron	Gentamicin sulfate	20100512-3	1
Caelo	Gentamicin sulfate	312012	1
Caelo	Gentamicin sulfate	3110806	1
Euro OTC	Gentamicin sulfate	2911034-02	1
Caelo	Gentamicin sulfate	32131-01582	1
Caelo	Gentamicin sulfate	73402189	1
EuRho	Gentamicin sulfate	FG1112482	1
Fargon	Gentamicin sulfate	13D24-N05	1
Sanacorp	Gentamicin sulfate	13189607	1

- 55 551 spectra from 335 *Apo-Ident* customers from a total of 20 473 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gentamicin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gentamicin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	428	2	75 448
Type B	0	348	197	80 803
Type C	0	394	56	55 551

The substance/substance group *Gentamicin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	99.5349 % (> 98.8372 %)
Type B	100.0000 % (> 99.9853 %)	63.8532 % (> 63.3028 %)
Type C	100.0000 % (> 99.8622 %)	87.5556 % (> 86.8889 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20640	21582	8.80	31.75
20661	20661	0.00	30.28
21081	21837	7.09	37.65
21578	21578	0.00	32.77
21580	21837	6.28	37.36
21582	21582	0.00	35.56
21684	21837	3.20	31.32
21697	21697	0.00	26.38
21837	21837	0.00	33.98
22604	21837	10.05	31.22
22857	22857	0.00	24.46

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Glucose monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20031-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Glucose monohydrate; Glucosum monohydricum; Saccharum amylaceum

Special notes

When selecting the *Glucose monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Glucose monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glucose monohydr...	82246219	20031	60	I 2009 000 291
Fagron	Glucose monohydr...	11L19-N13	20799	40	20120105
Fagron	Glucose monohydr...	14B04-B01	21274	40	20140304
Euro OTC	Glucose monohydr...	1509006	21905	40	20150914*
Euro OTC	Glucose monohydr...	1601016	22308	40	1601016*
Euro OTC	Glucose monohydr...	1604006	22538	40	20160511*
Euro OTC	Glucose monohydr...	1701002	23006	40	20170213*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 300 spectra of 7 reference samples from the substance/substance group *Glucose monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 578 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Glucose monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Glucose monohydrate	82246219	20031 [†]	15
Euro OTC	Glucose monohydrate	1210034-02	21285	40
Euro OTC	Glucose monohydrate	1509006	21905 [†]	20
Euro OTC	Glucose monohydrate	1601016	22308 [†]	20
Euro OTC	Glucose monohydrate	1607024	22692	40

- 81 213 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 696 spectra from 149 *Apo-Ident* customers from 205 batches from the substance/substance group *Glucose monohydrate*.

Supplier	Substance	Batch	Spectra
EuRho	Glucose monohydrate	1204044-01	2
Caelo	Glucose monohydrate	13157007	8
Caelo	Glucose monohydrate	12284229	5
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4163	2
EuRho	Glucose monohydrate	2710Q-02209	1
Euro OTC	Glucose monohydrate	2313E-02209	1
Dextro Energy GmbH	Glucose monohydrate	L4036	1
Dextro Energy GmbH/Krie...	Glucose monohydrate		1
Dextro Energy	Glucose monohydrate	13171	1
Noweda	Glucose monohydrate	1210034	1
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4164	1
Dextro Energy GmbH/Gehe	Glucose monohydrate	L4274	1
Dextro Energy GmbH	Glucose monohydrate	L4273	1
Dextro GmbH/Noweda	Glucose monohydrate	L5301	1
Fagron	Glucose monohydrate		1
Caelo	Glucose monohydrate	2101402	1
Euro OTC	Glucose monohydrate	96-01	1
GATT-KOLLER/PHOENIX	Glucose monohydrate	243/02142614	1
GATT-KOLLER/PHOENIX	Glucose monohydrate	243/02141714	1
Klenk	Glucose monohydrate	4298924	1
Eigenherstellung	Glucose monohydrate	40615HJK01	1
Caelo	Glucose monohydrate	5051401	1
Caelo	Glucose monohydrate	12284231	1
Sanacorp	Glucose monohydrate	12284230	1
Caelo	Glucose monohydrate	11021509	1
Euro OTC	Glucose monohydrate	1103027-01	1
Euro OTC	Glucose monohydrate	1210034-02	8
Klenk	Glucose monohydrate	13157002	8
Caelo	Glucose monohydrate	13157002	4
Caelo	Glucose monohydrate	13157005	13
Caelo	Glucose monohydrate	13157011	13
Caelo	Glucose monohydrate	13157008	2
Caelo	Glucose monohydrate	13157013	1
Caelo	Glucose monohydrate	13157012	1
Caelo	Glucose monohydrate	13157017	1
Caelo	Glucose monohydrate	13157019	9
Gehe	Glucose monohydrate	13157026	2
Caelo	Glucose monohydrate	13157026	3
Caelo	Glucose monohydrate	13H06-N08	2
Fagron	Glucose monohydrate	13H06-N08	15
Fagron	Glucose monohydrate	13B01-N03	5
Euro OTC	Glucose monohydrate	1401019-01	13
Fagron	Glucose monohydrate	13H14-B06-289483	1
Phönix Gotha	Glucose monohydrate	1401019-01	1
gehe	Glucose monohydrate	1401019-02	1
Fagron	Glucose monohydrate	1401019-01	1
Euro OTC	Glucose monohydrate	140101902	2
Ph.Eur.8.0	Glucose monohydrate	1401019-02	1
Euro OTC	Glucose monohydrate	1405004-01	12
Euro OTC	Glucose monohydrate	1401019-02	1
Euro OTC	Glucose monohydrate	140500401	2
Sonnenberg-Apotheke	Glucose monohydrate	140500401	1
Phönix Gotha	Glucose monohydrate	1405004-02	1
Euro OTC	Glucose monohydrate	1405004-02	1
EuRho/Phoenix	Glucose monohydrate	140500401	1
Euro OTC	Glucose monohydrate	140500402	1
Fagron	Glucose monohydrate	1407-808-307707	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Glucose monohydrate	1410019-01	7
Euro OTC	Glucose monohydrate	141001901	1
Caelo	Glucose monohydrate	14102401	4
Euro OTC	Glucose monohydrate	1410019-02	1
Caelo	Glucose monohydrate	14102411	5
AHD	Glucose monohydrate	14102407	1
Caelo	Glucose monohydrate	14102407	2
Gehe	Glucose monohydrate	14102411	1
Caelo	Glucose monohydrate	14102412	11
Fagron	Glucose monohydrate	14102412	2
Caelo	Glucose monohydrate	14102415	1
Caelo	Glucose monohydrate	14102416	5
Noweda 06.10.2014	Glucose monohydrate	14102416	1
Caelo	Glucose monohydrate	14102418	8
Caelo	Glucose monohydrate	14102419	1
Caelo	Glucose monohydrate	14102420	5
Gehe	Glucose monohydrate	14102419	1
Caelo	Glucose monohydrate	14102421	7
Caelo	Glucose monohydrate	14102424	1
Caelo	Glucose monohydrate	14102430	3
Bombastus	Glucose monohydrate	14334802	2
Noweda 10.02.2015	Glucose monohydrate	14334802	3
Caelo	Glucose monohydrate	14102430	1
Caelo	Glucose monohydrate	14334802	5
Caelo	Glucose monohydrate	14334807	2
Caelo	Glucose monohydrate	14334810	6
Caelo	Glucose monohydrate	14334808	1
Caelo	Glucose monohydrate	14334809	1
Fagron	Glucose monohydrate	14B04-B01	1
Fagron	Glucose monohydrate	14B04-B01-291143	2
Caelo	Glucose monohydrate	14334811	1
Caelo	Glucose monohydrate	14B04-B01-291137	1
Fagron	Glucose monohydrate	14B04-B01-291138	1
Fagron	Glucose monohydrate	14B04-B01-291137	2
Fagron	Glucose monohydrate	14B28-B02-291353	10
Fagron	Glucose monohydrate	14B28-B02-291354	4
Fagron	Glucose monohydrate	14I04-B08	1
Fagron	Glucose monohydrate	14I04B8298602	1
Fagron	Glucose monohydrate	14I04-B08-298602	1
Euro OTC	Glucose monohydrate	1504028-01	8
Euro/ Sanacorp	Glucose monohydrate	1504028-01	1
Euro OTC	Glucose monohydrate	150402801	1
Euro OTC	Glucose monohydrate	1504028-02	5
Euro OTC	Glucose monohydrate	1509006-01	8
Euro OTC	Glucose monohydrate	15040281	1
Caelo/Phönix	Glucose monohydrate	15095601	3
Euro OTC	Glucose monohydrate	1509006-02	1
Caelo	Glucose monohydrate	15095601	10
Euro OTC	Glucose monohydrate	15095601	1
Caelo	Glucose monohydrate	15095603	1
Caelo	Glucose monohydrate	15095605	2
Caelo	Glucose monohydrate	15095602	1
Caelo	Glucose monohydrate	15095611	2
Caelo	Glucose monohydrate	15095612	9
Noweda 30.07.2015	Glucose monohydrate	15095612	1
Caelo	Glucose monohydrate	15180001	8
Caelo	Glucose monohydrate	15180002	8
Caelo	Glucose monohydrate	15180003	2
Caelo	Glucose monohydrate	15180005	3
Caelo	Glucose monohydrate	15180010	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Glucose monohydrate	15180010	1
Caelo	Glucose monohydrate	15180012	11
Caelo	Glucose monohydrate	15180013	1
Caesar & Loretz GmbH	Glucose monohydrate	15180013	1
Caelo	Glucose monohydrate	15180015	7
Caelo	Glucose monohydrate	15180016	1
Fagron	Glucose monohydrate	1521-B06-309508	1
Caelo	Glucose monohydrate	15413302	1
Caelo/Noweda	Glucose monohydrate	15413301	1
Caelo	Glucose monohydrate	15413303	1
Caelo	Glucose monohydrate	15413304	14
Caesa/Phoenix	Glucose monohydrate	15413304	1
Caelo	Glucose monohydrate	15413401	1
Caesar & Loretz GmbH	Glucose monohydrate	15413402	1
Caelo	Glucose monohydrate	15413405	2
Caelo	Glucose monohydrate	15413402	1
Caelo	Glucose monohydrate	15413409	7
Caelo	Glucose monohydrate	15413410	2
Caelo	Glucose monohydrate	15413412	1
Cealo/ Noweda	Glucose monohydrate	15413412	1
Fagron	Glucose monohydrate	15A21-B06-309508	2
Euro OTC	Glucose monohydrate	1601016-01	10
Euroo	Glucose monohydrate	1604006-01	1
Euro OTC	Glucose monohydrate	1604006-01	4
Euro/Alliance Healthcare	Glucose monohydrate	1604006-01	1
Euro OTC	Glucose monohydrate	1604006-02	4
Caelo	Glucose monohydrate	16049101	7
Caelo	Glucose monohydrate	16049102	2
Caesar & Loretz/Noweda	Glucose monohydrate	16049102	1
Caelo	Glucose monohydrate	16049104	1
Caelo	Glucose monohydrate	16049103	1
Caelo	Glucose monohydrate	16049105	2
Euro OTC	Glucose monohydrate	1607024-01	2
Caelo	Glucose monohydrate	18071402	1
Caelo	Glucose monohydrate	16184801	2
Caelo	Glucose monohydrate	200415PJK01	1
Eigenherstellung	Glucose monohydrate	160915HML01	1
Caelo	Glucose monohydrate	28051507	1
Fagron	Glucose monohydrate	E144C	3
Caelo	Glucose monohydrate	E056D	1
Fagron	Glucose monohydrate	E0AJ5	1
Fagron	Glucose monohydrate	8G31-N09	1
Caelo	Glucose monohydrate	613011-3p	1
Eigenherstellung	Glucose monohydrate	30912HML01	1
Noweda	Glucose monohydrate	10082017	1
Euro OTC	Glucose monohydrate	1108061-01	1
Eurho/Sanacorp	Glucose monohydrate	1108061-01	2
Bombastus	Glucose monohydrate	1103027-01	1
Caelo	Glucose monohydrate	1108061-01	1
EuRho	Glucose monohydrate	1108061-01	1
Gehe	Glucose monohydrate	1108061-01	1
Noweda	Glucose monohydrate	1108061-01	1
EuRho	Glucose monohydrate	1108061-02	1
Euro OTC	Glucose monohydrate	1108061-02	3
Eigenherstellung	Glucose monohydrate	110913HJK02	1
Eigenherstellung	Glucose monohydrate	110912HML01	1
Caelo	Glucose monohydrate	11082014	1
Caelo	Glucose monohydrate	11082020	2
Euro OTC	Glucose monohydrate	1114U2209	1
Caelo	Glucose monohydrate	1131416	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Glucose monohydrate	11314516	6
Caelo	Glucose monohydrate	11314521	1
Caelo	Glucose monohydrate	11314526	1
Caelo	Glucose monohydrate	11314525	1
Caelo	Glucose monohydrate	11314519	2
Caelo	Glucose monohydrate	11314528	11
Noweda	Glucose monohydrate	11B22-N06	1
Noweda	Glucose monohydrate	11K16-N01	1
Caelo	Glucose monohydrate	11L19-N13	3
Fagron	Glucose monohydrate	11L19-N13	1
Euro OTC	Glucose monohydrate	1204044-01	3
Gehe	Glucose monohydrate	1204044-02	3
Noweda	Glucose monohydrate	1204044-01	3
Euro OTC	Glucose monohydrate	1204044-02	7
Eigenherstellung	Glucose monohydrate	120912HML02	1
Euro OTC	Glucose monohydrate	1210034-01	8
Gehe	Glucose monohydrate	1210034-01	5
Fagron	Glucose monohydrate	1210034-01	1
Roquette Lestrem FR/ No...	Glucose monohydrate	1210034-02	1
Caelo	Glucose monohydrate	1210034-02	1
Gehe	Glucose monohydrate	1210034-02	1
Caelo	Glucose monohydrate	12284202	9
Caelo	Glucose monohydrate	12284206	7
Caelo	Glucose monohydrate	12284204	2
Anzag 04.04.13	Glucose monohydrate	12284206	1
Phoenix	Glucose monohydrate	12284206	1
Caelo	Glucose monohydrate	12284219	11
Caelo	Glucose monohydrate	12284210	2
Caelo	Glucose monohydrate	12284222	3
Caelo	Glucose monohydrate	12284230	3
Fagron	Glucose monohydrate	12B09-N05	1
Fagron	Glucose monohydrate	12G30-N01	9
Kehr	Glucose monohydrate	12C26-N06	1
Noweda	Glucose monohydrate	12G30-N01	3
Anzag	Glucose monohydrate	12G30-N01	1
Caelo	Glucose monohydrate	12G30-N01	1
Euro OTC	Glucose monohydrate	1305030	1
Fagron	Glucose monohydrate	12G30-N01	1
Euro OTC	Glucose monohydrate	1305030-01	6
Euro OTC	Glucose monohydrate	130503001	1
Euro OTC	Glucose monohydrate	1305030-02	6
Caelo	Glucose monohydrate	1305030-02	1
Gehe	Glucose monohydrate	130503002	1
Euro OTC	Glucose monohydrate	1305030-02	1
Fagron	Glucose monohydrate	13A25-N01	12
Fagron	Glucose monohydrate	13AN01	1
Caelo	Glucose monohydrate	13157022	1
Fagron	Glucose monohydrate	13A25-n01	1
Fagron	Glucose monohydrate	13A25-N01	2
Fagron	Glucose monohydrate	13A25-No1	1
Fagron	Glucose monohydrate	13B01N03	1
Fargon	Glucose monohydrate	13C25-N09	1
Caelo	Glucose monohydrate	13B01-N03	1
FARGON	Glucose monohydrate	13b01-n03	1
Fagron	Glucose monohydrate	13C25N09	2
Fagron	Glucose monohydrate	13C25-N09	7
Fagron	Glucose monohydrate	13C25-N09	1
Euro OTC	Glucose monohydrate	140101901	1
Fagron	Glucose monohydrate	151780-0004	1
Phönix	Glucose monohydrate	1504028-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Glucose monohydrate	1406212209	1
Euro OTC	Glucose monohydrate	1601312209	1
Euro OTC	Glucose monohydrate	2023012-1	1
Eigenherstellung	Glucose monohydrate	180213HJK01	1
Euro OTC	Glucose monohydrate	2013U-02209	1
Fagron	Glucose monohydrate	270313PML01	1
Fagron	Glucose monohydrate	3413E-02209	1
Fagron	Glucose monohydrate	4213Q-02209	1
Euro OTC	Glucose monohydrate	3413Q-02209	1
Caelo	Glucose monohydrate	E144C	1
Euro OTC	Glucose monohydrate	E267X	1
Fagron	Glucose monohydrate	E571X	1
Fagron	Glucose monohydrate	E368B	1
Fagron	Glucose monohydrate	E524W	1
dextro energy / Noweda	Glucose monohydrate	L1299	1
Dextro/Krieger/15.05.13	Glucose monohydrate	L3092	1
Caelo	Glucose monohydrate		2
Caelo	Glucose monohydrate	14334805	2
Caelo	Glucose monohydrate	15095606	1
Euro OTC	Glucose monohydrate	1601016-02	1
Caelo	Glucose monohydrate	1134506	1
Fagron	Glucose monohydrate	11K16-N01	1
Caelo	Glucose monohydrate	14102427	1
Gutenberg-Apotheke	Glucose monohydrate	14B04-B01	1
Caesar & Lorenz	Glucose monohydrate	13157007	1
Fragon	Glucose monohydrate	13H06-N08	1
Caelo	Glucose monohydrate	1401019-01	1
Phönix	Glucose monohydrate	1401019-01	1
Sanacorp	Glucose monohydrate	3/AKD100	1
Phönix	Glucose monohydrate	1210334-02	1
Caelo	Glucose monohydrate	13A25-N01	5
Dextro Energy	Glucose monohydrate	L3270	1
Dextro	Glucose monohydrate	L0222	1

- 55 305 spectra from 335 *Apo-Ident* customers from a total of 20 411 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Glucose monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glucose monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	300	0	75 578
Type B	0	135	0	81 213
Type C	0	691	5	55 305

The substance/substance group *Glucose monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.5556 %)
Type C	100.0000 % (> 99.8622 %)	99.2816 % (> 98.8506 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20031	20031	0.00	33.29
20799	20031	2.25	36.01
21274	20031	2.51	26.82
21905	21905	0.00	30.66
22308	22308	0.00	26.17
22538	22538	0.00	36.23
23006	23006	0.00	26.52

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Glucose, anhydrous**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20982-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Glucose, anhydrous; Glucosum anhydricum; Saccharum amylaceum anhydricum

Special notes

When selecting the *Glucose, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Glucose, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glucose, anhydrous	12294514	20982	40	1402475
Caelo	Glucose, anhydrous	14033901	21363	40	20140214
Caelo	Glucose, anhydrous	14142310	21703	30	20140523
Caelo	Glucose, anhydrous	16050501	22586	40	20160317

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Glucose, anhydrous*. These samples are listed above in the [calibration samples](#) section.
- 75 728 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 85 spectra of 3 reference samples from the substance/substance group *Glucose, anhydrous*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Glucose, anhydrous	11017101	20262	30
Caelo	Glucose, anhydrous	11017110	20279	40
Caelo	Glucose, anhydrous	14142310	21703 [†]	15

- 81 263 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 218 spectra from 58 *Apo-Ident* customers from 114 batches from the substance/substance group *Glucose, anhydrous*.

Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	3121402	1
Caelo	Glucose, anhydrous	4071505	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	5081401	1
Caelo	Glucose, anhydrous	6031505	1
Caelo	Glucose, anhydrous	13178712	1
Caelo	Glucose, anhydrous	10091503	1
Caelo	Glucose, anhydrous	13041501	1
GEHE	Glucose, anhydrous	13178715	1
Caelo	Glucose, anhydrous	13329512	6
Caelo	Glucose, anhydrous	13329503	2
Caelo	Glucose, anhydrous	14033901	2
Gehe	Glucose, anhydrous	14033901	1
PHOENIX 30.05.2014	Glucose, anhydrous	13329514	1
Caelo	Glucose, anhydrous	14033902	5
Caelo	Glucose, anhydrous	14033906	4
Caelo	Glucose, anhydrous	14033907	3
GEHE 17.07.2014	Glucose, anhydrous	14033907	1
Caelo	Glucose, anhydrous	14033908	1
Caelo	Glucose, anhydrous	14051401	1
Caelo	Glucose, anhydrous	14142303	3
Caelo	Glucose, anhydrous	14142301	2
Fagron	Glucose, anhydrous	14142303	1
Caelo	Glucose, anhydrous	14142310	3
Caelo	Glucose, anhydrous	14142304	1
Gehe 27.11.14	Glucose, anhydrous	14142309	1
Phoenix	Glucose, anhydrous	14142310	1
Gehe Kassel	Glucose, anhydrous	14142313	1
Caelo	Glucose, anhydrous	14142313	1
Caelo	Glucose, anhydrous	14319304	3
Caelo	Glucose, anhydrous	14319302	1
Caelo	Glucose, anhydrous	14142314	1
Caelo	Glucose, anhydrous	1415U-03393	1
Caelo	Glucose, anhydrous	14319309	3
Gehe Kassel	Glucose, anhydrous	14319310	1
Caelo	Glucose, anhydrous	14319310	1
Caelo	Glucose, anhydrous	15095001	1
Caelo	Glucose, anhydrous	15095004	2
Caelo	Glucose, anhydrous	15148801	1
Phoenix	Glucose, anhydrous	15148801	1
Caelo	Glucose, anhydrous	15148802	3
Caelo	Glucose, anhydrous	15148807	4
Caelo	Glucose, anhydrous	15148808	2
Euro OTC	Glucose, anhydrous	15148808	1
Caelo	Glucose, anhydrous	15148809	1
Caelo	Glucose, anhydrous	15148810	2
Caelo	Glucose, anhydrous	15329001	2
Caesar & Loretz GmbH Hi...	Glucose, anhydrous	15321906	1
Fagron	Glucose, anhydrous	15329005	2
Caelo	Glucose, anhydrous	15329004	2
Rondell Apotheke	Glucose, anhydrous	15329003	1
Caelo	Glucose, anhydrous	15329005	1
Caelo	Glucose, anhydrous	15329006	2
Caesar & Loretz GmbH Hi...	Glucose, anhydrous	15329006	1
Caelo	Glucose, anhydrous	16050501	4
Phoenix	Glucose, anhydrous	15329010	2
Klenk	Glucose, anhydrous	16050502	1
Caelo	Glucose, anhydrous	16050502	2
Phoenix	Glucose, anhydrous	16050503	4
Caelo	Glucose, anhydrous	16050504	1
Caelo	Glucose, anhydrous	16050510	1
Caelo	Glucose, anhydrous	1614U3393	1
Gehe	Glucose, anhydrous	16157403	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	16157403	2
Apotheke-SiO2-Mischung	Glucose, anhydrous	18/15	1
Caelo	Glucose, anhydrous	1914I03393	1
Caelo	Glucose, anhydrous	16157406	1
Caelo	Glucose, anhydrous	208223393	1
Caelo	Glucose, anhydrous	402313393	2
Caelo	Glucose, anhydrous	106213393	1
Caelo	Glucose, anhydrous	3214M-03393	1
Caelo	Glucose, anhydrous	214U-03393	1
Caelo	Glucose, anhydrous	1001313393	1
Caelo	Glucose, anhydrous	712213393	1
Caelo	Glucose, anhydrous	11017108	1
Caelo	Glucose, anhydrous	11017121	1
Caelo	Glucose, anhydrous	1114A03393	1
Caelo	Glucose, anhydrous	11358818	2
Caelo	Glucose, anhydrous	11358813	1
Anzag 11.08.2012	Glucose, anhydrous	11358823	1
Caelo	Glucose, anhydrous	11358823	1
Caelo	Glucose, anhydrous	11358825	1
Caelo	Glucose, anhydrous	12141706	4
Caelo	Glucose, anhydrous	12141701	1
Caelo	Glucose, anhydrous	12141711	1
Jenne	Glucose, anhydrous	12141705	1
Phönix, 02.11.2012	Glucose, anhydrous	12141711	1
Phönix, 02.11.2012	Glucose, anhydrous	12141715	4
Caelo	Glucose, anhydrous	12141714	2
Caelo	Glucose, anhydrous	12141717	1
Caelo	Glucose, anhydrous	12141715	1
Synopharm am 10.09.2012	Glucose, anhydrous	12141717	1
Caelo	Glucose, anhydrous	12141718	1
Gehe 02.07.2013	Glucose, anhydrous	1224517	1
Caelo	Glucose, anhydrous	12294505	3
Sanacorp	Glucose, anhydrous	12294509	1
Caesar&loretz,Anzag	Glucose, anhydrous	12294509	1
Caelo	Glucose, anhydrous	12294510	3
Caelo	Glucose, anhydrous	12294509	3
Caelo	Glucose, anhydrous	12294514	1
Caelo	Glucose, anhydrous	12294515	2
Gehe 02.07.2013	Glucose, anhydrous	12294515	2
Caelo	Glucose, anhydrous	12294519	1
Phönix	Glucose, anhydrous	13178701	1
Caelo	Glucose, anhydrous	13178702	2
Phoenix	Glucose, anhydrous	12294517	1
Caelo	Glucose, anhydrous	12294517	2
Caelo	Glucose, anhydrous	1317815	1
Caelo	Glucose, anhydrous	13178704	4
Caelo	Glucose, anhydrous	13178711	3
Caelo	Glucose, anhydrous	13178715	4
Caelo	Glucose, anhydrous	13178718	1
Caelo	Glucose, anhydrous	13178716	1
Fagron	Glucose, anhydrous	13178716	1
Caelo	Glucose, anhydrous	13329501	3
Caelo	Glucose, anhydrous	13329504	2
Caelo	Glucose, anhydrous	13329507	2
Caelo	Glucose, anhydrous	15051301	1
Caelo	Glucose, anhydrous	1603213393	1
Caelo	Glucose, anhydrous	16101204	1
Caelo	Glucose, anhydrous	2513M03393	1
Caelo	Glucose, anhydrous	26041303	1
Caelo	Glucose, anhydrous	2102201301	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Glucose, anhydrous	25061204	1
Caelo	Glucose, anhydrous	16101205	1
Caelo	Glucose, anhydrous	3513I-03393	1
Caelo	Glucose, anhydrous	4313Q3393	1
Caelo	Glucose, anhydrous	4713I-03393	1
Caelo	Glucose, anhydrous	5013I3393	1
Caelo	Glucose, anhydrous	AKD14	1
Caelo	Glucose, anhydrous	Glucose2	1
Caelo	Glucose, anhydrous	Glucose1	1
Caelo	Glucose, anhydrous	15095003	2
Caelo	Glucose, anhydrous	15095005	1
Caelo	Glucose, anhydrous	12294509-3425311150	1
PHOENIX 30.05.2014	Glucose, anhydrous	14033902	1
GEHE	Glucose, anhydrous	16157406	1
Caelo	Glucose, anhydrous	23091401	1
Caelo	Glucose, anhydrous	12141705	1
Caelo	Glucose, anhydrous	2013Q-03393	1

- 55 783 spectra from 335 *Apo-Ident* customers from a total of 20 498 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Glucose, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glucose, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	75 728
Type B	0	74	11	81 263
Type C	0	204	14	55 783

The substance/substance group *Glucose, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9853 %)	87.0588 % (> 83.5294 %)
Type C	100.0000 % (> 99.8622 %)	93.5780 % (> 92.2018 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20982	20982	0.00	33.87
21363	20982	5.38	34.51
21703	20982	5.81	34.52
22586	20982	5.84	33.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Glutamic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20436-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Glutamic acid; Acidum glutamicum; Acidum glutaminicum

Special notes

When selecting the *Glutamic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Glutamic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Pharmorgana	Glutamic acid	1000110813	20436	40	AR-13-FG-001126-01
Fagron	Glutamic acid	11I30-N02	20840	40	AR-15-FG-010446-02
Euro OTC	Glutamic acid	L1405023-01	21720	40	20140627
Euro OTC	Glutamic acid	1604056	22562	40	20160523*

Validation samples

A total of 213 227 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 *Glutamic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Glutamic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Glutamic acid	L1211001-01	21282	40
Euro OTC	Glutamic acid	L1405023-01	21720 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 2 *Apo-Ident* customers from 6 batches from the substance/substance group *Glutamic acid*.

Supplier	Substance	Batch	Spectra
Euro OTC	Glutamic acid	28071505	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Fagron	Glutamic acid	6120	1
Fagron	Glutamic acid	13J21-N10	2
Fagron	Glutamic acid	13G15-N06	3
Euro OTC	Glutamic acid	WE11020045	1
Fagron	Glutamic acid	3031502	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Glutamic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glutamic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	60	0	81 288
Type C	0	9	0	55 992

The substance/substance group *Glutamic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20436	20436	0.00	71.45
20840	20840	0.00	37.84
21720	22562	11.97	38.12
22562	22562	0.00	39.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Glycine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20823-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Glycine; Glycinum

Special notes

When selecting the *Glycine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Glycine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Glycine	12G13-N04	20823	40	1401163
Fagron	Glycine	13G09-N03	21276	40	20120711
Euro OTC	Glycine	1402022-01	21284	40	20140328
Euro OTC	Glycine	1402022-01	21534	40	AR-15-FG-005430-01
Caelo	Glycine	13157303	21687	40	20130625
Caelo	Glycine	14147006	21818	40	AR-16-FG-012263-01

Validation samples

A total of 213 227 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 *Glycine*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Glycine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Glycine	1402022-01	21534 [†]	20
Caelo	Glycine	13157303	21687 [†]	20
Caelo	Glycine	14147006	21818 [†]	20
Euro OTC	Glycine	1605035	22683	40

- 81 248 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Glycine*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Glycine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Glycine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	100	0	81 248
Type C	0	0	0	56 001

The substance/substance group *Glycine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20823	20823	0.00	48.22
21276	20823	14.56	46.59
21284	21534	10.48	66.55
21534	21534	0.00	67.71
21687	21534	9.49	66.39
21818	21818	0.00	39.19

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Gramicidin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20203-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Gramicidin; Gramicidinum

Special notes

When selecting the *Gramicidin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Gramicidin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Gramicidin	11A27-N32	20203	40	AR-12-FG-006258-01
Fagron	Gramicidin	13J15-N02	21253	40	AR-15-FG-000813-01
Fagron	Gramicidin	14C07-B06-292886	21544	40	20140418

Validation samples

A total of 213 227 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 *Gramicidin*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Gramicidin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Gramicidin	15H18-B01-316269	22748	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 batches from the substance/substance group *Gramicidin*.

Supplier	Substance	Batch	Spectra
Fagron	Gramicidin	11F-24-N03	1
Fagron	Gramicidin	12I07-N03	1
Fagron	Gramicidin	14H06-B03-297614	3
Fagron	Gramicidin	12K22-N12	1
Caelo	Gramicidin	13J15-N02	1
Fagron	Gramicidin	15C11-B04-306766	1
Fagron	Gramicidin	B3200266	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Gramicidin	B3200202	1
Fagron	Gramicidin	12F18-N09	1
Fagron	Gramicidin	12/07-N03	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Gramicidin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Gramicidin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	12	0	55 989

The substance/substance group *Gramicidin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20203	20203	0.00	27.14
21253	21253	0.00	21.26
21544	20203	5.63	23.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Griseofulvin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20939-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Griseofulvin; Griseofulvinum

Special notes

When selecting the *Griseofulvin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Griseofulvin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Griseofulvin	13D19-N03	20939	40	1401419
Fagron	Griseofulvin	14E16-B01-296834	21725	40	20140526

Validation samples

A total of 213 227 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 *Griseofulvin*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Griseofulvin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Griseofulvin	9B13-N08	20236	40
Fagron	Griseofulvin	14E16-B01-296834	21725 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 22 spectra from 12 *Apo-Ident* customers from 16 batches from the substance/substance group *Griseofulvin*.

Supplier	Substance	Batch	Spectra
Fagron	Griseofulvin	13L13-B08-290316	2
Fagron	Griseofulvin	13L13-B08-290317	1
Phönix Gotha	Griseofulvin	140410	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
Fagron	Griseofulvin	13L-13B08	1
Fagron	Griseofulvin	15B10-B06-306547	1
Fagron	Griseofulvin	15L03-B04-315624	2
Fagron	Griseofulvin	13L13-B08	1
Fagron	Griseofulvin	15B10-B06-396547	1
Fagron	Griseofulvin	140410	1
Fagron	Griseofulvin	16F13-B06-323068	2
Caelo	Griseofulvin	100910	1
Fagron	Griseofulvin	16F13-B06-323067	1
Fagron	Griseofulvin	10F03-N12	1
Caelo	Griseofulvin	16F13-B06-323068	1
Sanacorp/ F	Griseofulvin	12B06-N07	1
Phönix Gotha	Griseofulvin	12D04-N12	2
Fagron	Griseofulvin	13D19-N03	1
Fagron	Griseofulvin	12F18-N04	1

- 55 979 spectra from 335 *Apo-Ident* customers from a total of 20 595 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Griseofulvin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Griseofulvin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	17	5	55 979

The substance/substance group *Griseofulvin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	77.2727 % (> 63.6364 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20939	20939	0.00	63.20
21725	20939	9.06	63.30

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Guaifenesin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20551-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Guaifenesin; Guaifenesinum; Guajacolum glycerinicum

Special notes

When selecting the *Guaifenesin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Guaifenesin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Guaifenesin	11277411	20551	40	AR-13-FG-008660-01
Euro OTC	Guaifenesin	1212002-01	21287	40	20121214
Euro OTC	Guaifenesin	1506044	21864	40	0000010494
Euro OTC	Guaifenesin	1605005	22555	40	20160525*
Caelo	Guaifenesin	163333	23051	40	20161221*

Validation samples

A total of 213 227 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 *Guaifenesin*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Guaifenesin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Guaifenesin	11277411	20563	40
Euro OTC	Guaifenesin	1506044	21864 [†]	20
Euro OTC	Guaifenesin	1701011	22993	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 4 batches from the substance/substance group *Guaifenesin*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Phoenix 05.07.2014	Guaifenesin	1402023-01	2
Caelo	Guaifenesin	1212002-01	1
Caelo	Guaifenesin	12277311	1
Caelo	Guaifenesin	12277307	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Guaifenesin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Guaifenesin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	0	81 248
Type C	0	5	0	55 996

The substance/substance group *Guaifenesin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20551	20551	0.00	36.26

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21287	20551	8.41	37.04
21864	21864	0.00	36.93
22555	22555	0.00	35.77
23051	23051	0.00	36.84

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hard fat (601)**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20496-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hard fat (601); Adeps solidus (601)

Special notes

When selecting the *Hard fat (601)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hard fat (601)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hard fat (601)	11320006	20496	40	20111123
Caelo	Hard fat (601)	13296104	20997	40	1403144
Caelo	Hard fat (601)	15184905	21974	40	20150611
Caelo	Hard fat (601)	162364	22648	40	20160823*

Validation samples

A total of 213 227 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 *Hard fat (601)*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Hard fat (601)*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hard fat (601)	14099604	21488	40
Caelo	Hard fat (601)	15184905	21974 [†]	20
Caelo	Hard fat (601)	162364	22766	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Hard fat (601)*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Hard fat (601)	15184901	1
Caelo	Hard fat (601)	13296104	1
Caelo	Hard fat (601)	14099608	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hard fat (601)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hard fat (601)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	74	26	81 248
Type C	0	3	0	55 998

The substance/substance group *Hard fat (601)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	74.0000 % (> 71.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20496	22648	9.72	29.32
20997	20997	0.00	21.90
21974	22648	7.85	25.09
22648	22648	0.00	25.87

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Heparin sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20638-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Heparin sodium; Heparinum natricum; Natrii heparini

Special notes

When selecting the *Heparin sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Heparin sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Heparin sodium	1202002-01	20638	40	20120326
Fagron	Heparin sodium	12H30-N07	20798	40	1404230
Euro OTC	Heparin sodium	12050009-03	21294	40	AR-15-FG-007427-02
Euro OTC	Heparin sodium	1605022-01	22804	40	9699
Fagron	Heparin sodium	12L20-B01-317990	22824	40	20130312

Validation samples

A total of 213 227 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 *Heparin sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *Heparin sodium*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 *Apo-Ident* customers from 8 batches from the substance/substance group *Heparin sodium*.

Supplier	Substance	Batch	Spectra
Fagron	Heparin sodium	13G03-N13	3
Fagron	Heparin sodium	12G19-B02-313422	1
Fagron	Heparin sodium	14D09-B08-293944	2
Fagron	Heparin sodium	12H30-N07	2
Fagron	Heparin sodium	14D09-B08-307077	1
Fagron	Heparin sodium	14D09-B08	1
Fagron	Heparin sodium	11190188SH	2
Euro OTC	Heparin sodium	1202002-01	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Heparin sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Heparin sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	0	0	81 348
Type C	0	11	2	55 988

The substance/substance group *Heparin sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20638	20798	11.57	58.32
20798	20798	0.00	54.68
21294	21294	0.00	62.97
22804	22804	0.00	61.16
22824	20798	14.92	57.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Histamine dihydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20963-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Histamine dihydrochloride; Histamini dihydrochloridum; Histaminum hydrochloricum

Special notes

When selecting the *Histamine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Histamine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Histamine dihydr...	1111004-02	20963	40	1403674
Fagron	Histamine dihydr...	14G16-B02-299175	21668	80	20140729
Euro OTC	Histamine dihydr...	1506030	21863	40	0000010384

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 3 reference samples from the substance/substance group *Histamine dihydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Histamine dihydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Histamine dihydrochloride	pending	20158	40
Fagron	Histamine dihydrochloride	14G16-B02-299175	21668 [†]	20
Euro OTC	Histamine dihydrochloride	1506030	21863 [†]	20

- 81268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 40 spectra from 20 *Apo-Ident* customers from 20 batches from the substance/substance group *Histamine dihydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Histamine dihydrochloride	15E08-B06-313037	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
Euro OTC	Histamine dihydrochloride	3031503	1
Euro OTC	Histamine dihydrochloride	1506030-01	2
Caelo	Histamine dihydrochloride	130500601	1
Euro OTC	Histamine dihydrochloride	1411012-01	1
Fagron	Histamine dihydrochloride	454545	1
Euro OTC	Histamine dihydrochloride	1104004-03	1
Euro OTC	Histamine dihydrochloride	1104004-02	1
Euro OTC	Histamine dihydrochloride	1111004-01	7
Euro OTC	Histamine dihydrochloride	111004-02	1
Alliance Healthcare/Now...	Histamine dihydrochloride	1111004-01	1
Euro OTC	Histamine dihydrochloride	1111004-02	3
Caelo	Histamine dihydrochloride	1111004-02	1
Fagron	Histamine dihydrochloride	11E25-N07	2
Fagron	Histamine dihydrochloride	12D02-N16	1
Phönix	Histamine dihydrochloride	12e29n09	1
Fagron	Histamine dihydrochloride	12E29-N09	2
Fagron	Histamine dihydrochloride	12K06-N08	5
Euro OTC	Histamine dihydrochloride	12K06-N08	2
Euro OTC	Histamine dihydrochloride	1305006-01	1
Euro OTC	Histamine dihydrochloride	20021412	1
Fagron	Histamine dihydrochloride	25051202	1
Fagron	Histamine dihydrochloride	28051305	1

- 55 961 spectra from 335 *Apo-Ident* customers from a total of 20 591 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Histamine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Histamine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	70	10	81 268
Type C	0	40	0	55 961

The substance/substance group *Histamine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	87.5000 % (> 83.7500 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 85.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20963	20963	0.00	73.00
21668	21863	5.19	73.47
21863	21863	0.00	73.65

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hyaluronic acid sodium salt**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21036-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hyaluronic acid sodium salt; Natrii Hyaluronas

Special notes

When selecting the *Hyaluronic acid sodium salt* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hyaluronic acid sodium salt*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Hyaluronic acid ...	L1302028-01	21036	40	1403532
Euro OTC	Hyaluronic acid ...	L1302028-01	21074	60	20130314
Audor	Hyaluronic acid ...	AP30101404H	22262	35	20141203

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 135 spectra of 3 reference samples from the substance/substance group *Hyaluronic acid sodium salt*. These samples are listed above in the [calibration samples](#) section.
- 75 743 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Hyaluronic acid sodium salt*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Hyaluronic acid sodium salt	7071105	20518	40
Spinnrad	Hyaluronic acid sodium salt	51240342	20779	40
Audor Pharma	Hyaluronic acid sodium salt	AP30101404H	22262 [†]	20

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 13 batches from the substance/substance group *Hyaluronic acid sodium salt*.

Supplier	Substance	Batch	Spectra
Caelo	Hyaluronic acid sodium salt	14188702	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
Calo/AHD	Hyaluronic acid sodium salt	14364704	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101305H	2
Audor Pharma	Hyaluronic acid sodium salt	AP30101404H	2
Fagron	Hyaluronic acid sodium salt	L1311012-01	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101505H	1
Euro OTC	Hyaluronic acid sodium salt	L1512025-01	2
Audor Pharma	Hyaluronic acid sodium salt	30101204H	1
Caelo	Hyaluronic acid sodium salt	1263303	1
Audor Pharma	Hyaluronic acid sodium salt	AP30101204H	1
Caelo	Hyaluronic acid sodium salt	14364706	1
Caelo	Hyaluronic acid sodium salt	15204903	3
Caelo	Hyaluronic acid sodium salt	15204901	1

- 55 983 spectra from 335 *Apo-Ident* customers from a total of 20 598 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hyaluronic acid sodium salt* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyaluronic acid sodium salt* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	135	0	75 743
Type B	0	58	42	81 238
Type C	0	16	2	55 983

The substance/substance group *Hyaluronic acid sodium salt* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.5556 %)
Type B	100.0000 % (> 99.9853 %)	58.0000 % (> 55.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21036	21036	0.00	35.72
21074	21036	2.34	37.10
22262	21036	17.08	29.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydrochlorothiazide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20323-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydrochlorothiazide; Hydrochlorothiazidum

Special notes

When selecting the *Hydrochlorothiazide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydrochlorothiazide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hydrochlorothiaz...	11E04-N10	20323	40	AR-12-FG-008900-01
Fagron	Hydrochlorothiaz...	11L01-N02	20888	40	20111209
Caelo	Hydrochlorothiaz...	13008505	21589	40	AR-15-FG-014461-01

Validation samples

A total of 213 227 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 *Hydrochlorothiazide*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Hydrochlorothiazide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hydrochlorothiazide	11L01-N02	20378	40
Caelo	Hydrochlorothiazide	13008505	21589 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 69 spectra from 47 *Apo-Ident* customers from 33 batches from the substance/substance group *Hydrochlorothiazide*.

Supplier	Substance	Batch	Spectra
Fagron	Hydrochlorothiazide	12A03-B40	3
Fagron	Hydrochlorothiazide	12A03-B40-286110	1
Fagron	Hydrochlorothiazide	12A03-B40-286111	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
Fagron	Hydrochlorothiazide	12B23-N05	1
Fagron	Hydrochlorothiazide	12L14-N11	2
Caelo	Hydrochlorothiazide	13008509	4
Caelo	Hydrochlorothiazide	13008507	1
Fagron	Hydrochlorothiazide	13C25-N08	6
Caelo	Hydrochlorothiazide	14009701	10
Fagron	Hydrochlorothiazide	14B10-B01-294558	7
Fagron	Hydrochlorothiazide	14B10B01	1
Fagron	Hydrochlorothiazide	14b10-b01-294558	1
Fagron	Hydrochlorothiazide	14B10-B01-300822	2
Caelo	Hydrochlorothiazide	14B10-B01-305043	1
Caesar & Loretz GmbH Hi...	Hydrochlorothiazide	152310	3
Caelo	Hydrochlorothiazide	15231008	1
Phoenix	Hydrochlorothiazide	15231003	1
Caelo	Hydrochlorothiazide	15231003	1
Fagron	Hydrochlorothiazide	15E04-B03-309670	1
Fagron	Hydrochlorothiazide	15K16-B01-319833	1
Fagron	Hydrochlorothiazide	5013Q-03660	1
Fagron	Hydrochlorothiazide	16F17-B07-324062	1
Caelo	Hydrochlorothiazide	P157/14	1
Sanacorp	Hydrochlorothiazide	12A03-B40-26111	1
Caelo	Hydrochlorothiazide	13008504	1
Caelo	Hydrochlorothiazide	11101n02	1
Caelo	Hydrochlorothiazide	CQ1108	1
Fagron	Hydrochlorothiazide	11101-n02	2
Fagron	Hydrochlorothiazide	12E04-N02	1
Fagron	Hydrochlorothiazide	11G12-N12	1
Fagron	Hydrochlorothiazide	11Lo1-No2	1
Gehe	Hydrochlorothiazide	12E04-N02	1
Fagron	Hydrochlorothiazide	11L01-N02	1
Fagron	Hydrochlorothiazide	11L01-No2	1
Caelo	Hydrochlorothiazide	12L14-N11	2
Fagron	Hydrochlorothiazide	2002311234	1

- 55 932 spectra from 335 *Apo-Ident* customers from a total of 20 578 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydrochlorothiazide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrochlorothiazide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	60	0	81 288
Type C	0	67	2	55 932

The substance/substance group *Hydrochlorothiazide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.1014 % (> 92.7536 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20323	20323	0.00	21.77
20888	20323	9.73	22.31
21589	21589	0.00	21.36

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydrocortisone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20006-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydrocortisone; Hydrocortisonum purum

Special notes

When selecting the *Hydrocortisone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydrocortisone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydrocortisone	91050209	20006	30	I 2009 000 255
Caelo	Hydrocortisone	10083801	20110	40	20100416
Euro OTC	Hydrocortisone	1206018-01	21293	40	20130727
Caelo	Hydrocortisone	13341502	21461	40	20131203
Caelo	Hydrocortisone	13341502	21463	40	20131203
Euro OTC	Hydrocortisone	1509029	21899	40	20151014*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hydrocortisone	16A19-B06-320970	22829	40	20160204
Fagron	Hydrocortisone	16A19-B06-321981	22838	40	1702302
Euro OTC	Hydrocortisone	1611016	22910	40	20161220*
Fagron	Hydrocortisone	16H01-B01-326071	22928	40	20160907
Caelo	Hydrocortisone	13341502	21463SI	40	20131203
Euro OTC	Hydrocortisone	1509029	21899SI	36	20151014*
Fagron	Hydrocortisone	16A19-B06-320970	22829SI	30	20160204
Fagron	Hydrocortisone	16A19-B06-321981	22838SI	31	1702302
Fagron	Hydrocortisone	16H01-B01-326071	22928SI	40	20160907

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 567 spectra of 15 reference samples from the substance/substance group *Hydrocortisone*. These samples are listed above in the [calibration samples](#) section.
- 75 311 spectra from a total of 1567 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 305 spectra of 11 reference samples from the substance/substance group *Hydrocortisone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydrocortisone	13341502	21461 [†]	20
Caelo	Hydrocortisone	13341502	21463 [†]	20
Euro OTC	Hydrocortisone	1509029	21899 [†]	20
Caelo	Hydrocortisone	160952	22778	40
Fagron	Hydrocortisone	16A19-B06-321981	22837	40
Fagron	Hydrocortisone	16A19-B06-320970	not required	20
Caelo	Hydrocortisone	13341502	21463SI [†]	20
Euro OTC	Hydrocortisone	1509029	21899SI [†]	15
Caelo	Hydrocortisone	160952	22778SI	40
Fagron	Hydrocortisone	16A19-B06-321981	22837SI	30
Euro OTC	Hydrocortisone	1611016	22910SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 81 043 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 690 spectra from 214 *Apo-Ident* customers from 194 batches from the substance/substance group *Hydrocortisone*.

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	13341504	5
Caelo	Hydrocortisone	12167007	9
Euro OTC	Hydrocortisone	1112030-01	10
Caelo	Hydrocortisone	13069501	8
Caelo	Hydrocortisone	12167010	11
Caelo	Hydrocortisone	13069510	6
Großhandel	Hydrocortisone	13H08-B01-285472	1
Euro OTC	Hydrocortisone	715Q-01719	1
Caelo	Hydrocortisone	3081604	1
Euro OTC	Hydrocortisone	4091510	1
Bestand	Hydrocortisone	911Q-01719	2
Euro OTC	Hydrocortisone	6051502	1
Caelo	Hydrocortisone	9271205	2
Euro OTC	Hydrocortisone	1201618-01	1
Nachprüfung 2312	Hydrocortisone	10282201	1
Caelo	Hydrocortisone	10282208	2
Euro OTC	Hydrocortisone	1204037-01	21
Euro OTC	Hydrocortisone	1206018-01	19
Caelo	Hydrocortisone	1206018-01	1
Fagron	Hydrocortisone	120601801	1
Gehe	Hydrocortisone	1206018-01	2
Fagron	Hydrocortisone	1206018-01	2
Fagron	Hydrocortisone	12091401	1
Caesar&Loretz GmbH	Hydrocortisone	12104308	1
Caelo	Hydrocortisone	13069505	3
GEHE 14.04.2014	Hydrocortisone	13069509	1
Alliance Health 11.01.2...	Hydrocortisone	1315505	1
Caelo	Hydrocortisone	13155601	11
Caelo	Hydrocortisone	13155603	9
Caelo	Hydrocortisone	13155602	9
AHD	Hydrocortisone	13155601	2
Caelo	Hydrocortisone	13155604	9
Caelo	Hydrocortisone	13155605	4
Caelo	Hydrocortisone	13155611	2
GEHE 03.05.2014	Hydrocortisone	13155605	1
Noweda	Hydrocortisone	13155605	1
Pharmacia&Upjohn/ Phönix	Hydrocortisone	13155614	1
Caelo	Hydrocortisone	13155614	2
Phönix Caesar u. Loretz	Hydrocortisone	13225507	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	13341501	5
Caelo	Hydrocortisone	133341502	1
Caelo	Hydrocortisone	13341502	6
Phönix Gotha	Hydrocortisone	13341502	1
Alliance Health 25.04.2...	Hydrocortisone	13341503	3
Phönix	Hydrocortisone	13341504	2
Caelo	Hydrocortisone	13341503	1
Phönix	Hydrocortisone	13341508	1
Caelo	Hydrocortisone	13341508	3
Caelo	Hydrocortisone	13341509	4
Sanacorp	Hydrocortisone	13341509	1
Caelo	Hydrocortisone	13341510	8
Fagron	Hydrocortisone	13341510	1
Caelo	Hydrocortisone	13341511	2
Caelo	Hydrocortisone	13342504	1
Caelo	Hydrocortisone	13H08-B01-285471	1
Fagron	Hydrocortisone	13H08-B01-285472	4
Fagron	Hydrocortisone	13H08-B01-285473	1
Fagron	Hydrocortisone	13K22-B011	1
Fagron	Hydrocortisone	13H08-B01-28571	1
Fagron	Hydrocortisone	13K22-B01	1
Fagron	Hydrocortisone	14/05-B02-300227	2
Fagron	Hydrocortisone	13K22-B01-288280	1
Fagron	Hydrocortisone		1
Fagron	Hydrocortisone	13K22-B01-288282	1
fargron	Hydrocortisone	13K22-B01-288284	1
Caelo	Hydrocortisone	140301305	1
Fagron	Hydrocortisone	14/05-B02-300227	1
EuRho	Hydrocortisone	1405001-01	3
Euro OTC	Hydrocortisone	1405001-01	2
Gehe	Hydrocortisone	1405001-01	2
Phönix	Hydrocortisone	1408023-01	1
Euro OTC	Hydrocortisone	1408023-01	3
Caelo	Hydrocortisone	14115103	3
Caelo	Hydrocortisone	14115104	1
Caelo	Hydrocortisone	14115105	3
Caelo	Hydrocortisone	14115107	6
Berkel AHK	Hydrocortisone	14115107	1
Caelo	Hydrocortisone	14115108	1
Caelo	Hydrocortisone	14301304	3
Caelo	Hydrocortisone	14301305	5
Berkel AHK	Hydrocortisone	14301305	1
Caelo	Hydrocortisone	14301306	1
phönix	Hydrocortisone	14301306	1
Caelo	Hydrocortisone	14301307	1
Caelo	Hydrocortisone	14301310	9
Gehe,27.0415	Hydrocortisone	14301310	1
Caelo	Hydrocortisone	14301311	5
Caelo	Hydrocortisone	14301312	4
Caelo	Hydrocortisone	14301313	4
Caelo	Hydrocortisone	1430312	1
Caelo	Hydrocortisone	1431311	1
Fagron	Hydrocortisone	14B04-B02-293424	2
Fagron	Hydrocortisone	14B04-B02	1
Fagron	Hydrocortisone	14B04-B02-293422	1
Fagron	Hydrocortisone	14B04-B02-293423	2
Bombastus	Hydrocortisone	14I05-B02-300227	1
Euro OTC	Hydrocortisone	1501034-01	5
Fagron	Hydrocortisone	14I05-B02-300228	1
Caelo	Hydrocortisone	1501105	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	15021104	2
Caelo	Hydrocortisone	15021105	3
Caelo	Hydrocortisone	15021106	2
Caelo	Hydrocortisone	15021107	7
Phönix Gotha	Hydrocortisone	15021107	1
Caesar & Loretz GmbH	Hydrocortisone	15021107	1
Caelo	Hydrocortisone	1505016-01	1
Euro OTC	Hydrocortisone	1505010601	1
Euro OTC	Hydrocortisone	1505016-01	15
Euro OTC	Hydrocortisone	150516-01	1
Euro OTC	Hydrocortisone	1509029-01	6
Phoenix	Hydrocortisone	1509029-01	1
Upjohn/Phönix	Hydrocortisone	1509029-01	1
Caelo	Hydrocortisone	1518013	1
Euro OTC	Hydrocortisone	150929-01	1
Caelo	Hydrocortisone	15181003	6
Caesar&Loretz,Phoenix	Hydrocortisone	15181004	1
Phönix Gotha	Hydrocortisone	15181004	1
Caelo	Hydrocortisone	15181004	6
Beiersdorf/ Vedono	Hydrocortisone	15181004	1
Caelo	Hydrocortisone	15181006	7
Laborchemie Apolda/Phönix	Hydrocortisone	15181004	1
Caelo	Hydrocortisone	15181007	3
Caelo	Hydrocortisone	15181013	5
Caelo	Hydrocortisone	15181008	1
Caelo	Hydrocortisone	15181012	2
Caesar & Loretz GmbH	Hydrocortisone	15181012	1
Caelo	Hydrocortisone	15216101	4
Caelo	Hydrocortisone	15181014	1
Caelo	Hydrocortisone	15278702	3
Caelo	Hydrocortisone	15278703	6
Caelo	Hydrocortisone	15278705	4
Caelo	Hydrocortisone	15278706	1
Caelo	Hydrocortisone	15356902	1
Fagron	Hydrocortisone	15D14-B02	1
Fagron	Hydrocortisone	15D14-B02-311696	4
Fagron	Hydrocortisone	15I25-B01-320154	1
Fagron	Hydrocortisone	15I25-B01-318486	1
Caelo	Hydrocortisone	16004603	2
Caelo	Hydrocortisone	16004604	8
Bionorica	Hydrocortisone	16004604	1
Caelo	Hydrocortisone	16004605	4
Caelo	Hydrocortisone	16004607	5
Caelo	Hydrocortisone	16004608	2
Caelo	Hydrocortisone	16004612	2
Caelo	Hydrocortisone	16004611	1
Caelo	Hydrocortisone	16095201	3
Caelo	Hydrocortisone	16095202	1
Caelo	Hydrocortisone	16095209	2
/ AHD	Hydrocortisone	16095202	1
Caelo	Hydrocortisone	260416v4	1
Fagron	Hydrocortisone	19051403	1
Caelo	Hydrocortisone	16272305	1
Fagron	Hydrocortisone	2180	1
Euro OTC	Hydrocortisone	29011504	1
Sanacorp	Hydrocortisone	42/AKD6	1
Fagron	Hydrocortisone	K05B20130407M	1
Fagron	Hydrocortisone	K05B20131101	1
Fagron	Hydrocortisone	5061305	1
Fagron	Hydrocortisone	5061304	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone	7101301	1
Caelo	Hydrocortisone	810911	1
Caelo	Hydrocortisone	113I-01719	1
Caelo	Hydrocortisone	9360908	1
Caelo	Hydrocortisone	10340502	2
Euro OTC	Hydrocortisone	1107005-02	7
Fagron	Hydrocortisone	11/19-N03	2
Fagron	Hydrocortisone	11021403	1
Euro OTC	Hydrocortisone	1107005-01	2
Caelo	Hydrocortisone	11021302	1
EuRho	Hydrocortisone	1107005-02	1
Euro OTC	Hydrocortisone	1107005-03	9
Anzag ek:10.01EUR 18.07.12	Hydrocortisone	1107005-03	1
Caelo	Hydrocortisone	11098413	1
Sanacorp	Hydrocortisone	1112030-01	1
Caelo	Hydrocortisone	1109845	1
AHC 02.09.13 EK9,85	Hydrocortisone	1112030-01	1
Caelo	Hydrocortisone	11260303	1
Caelo	Hydrocortisone	11260302	1
Caelo	Hydrocortisone	11260304	1
Gehe	Hydrocortisone	11260305	1
Caelo	Hydrocortisone	11260305	1
Gehe	Hydrocortisone	11260303	1
Caelo	Hydrocortisone	11260307	2
Anzag	Hydrocortisone	11260305	1
Caelo	Hydrocortisone	11260308	4
Sanacorp	Hydrocortisone	11260309	2
Caelo	Hydrocortisone	11260309	3
Kehr	Hydrocortisone	11260309	1
Phoenix am 11.06.2012	Hydrocortisone	11260310	1
Caelo	Hydrocortisone	11273703	1
Caelo	Hydrocortisone	11273704	2
Fagron	Hydrocortisone	11k18n01	1
Großhandel	Hydrocortisone	11L09-N06	1
Fagron	Hydrocortisone	11K18-N01	2
Fagron	Hydrocortisone	11D07-N02	1
Phönix	Hydrocortisone	11119-N03	1
Fagron	Hydrocortisone	11L09-N06	1
Fagron	Hydrocortisone	11L09-N09	1
Anzag 14.12.12 ek:10,01	Hydrocortisone	1202032-01	1
Caelo	Hydrocortisone	11L09-N06	1
Euro OTC	Hydrocortisone	1202032-01	3
A.H. 10.06.13 ek: 10,01EUR	Hydrocortisone	1204037-01	1
Gehe	Hydrocortisone	1202032-01	1
Phönix	Hydrocortisone	1204037-01	1
Caelo	Hydrocortisone	120403701	1
Euro OTC	Hydrocortisone	120403701	2
Anzag/EuRho	Hydrocortisone	1204037-01	1
Euro OTC	Hydrocortisone	1204307-01	1
Caelo	Hydrocortisone	12104301	2
Noweda	Hydrocortisone	12104303	1
Caelo	Hydrocortisone	12104303	8
Caelo	Hydrocortisone	12104304	11
Großhandel	Hydrocortisone	12104304	1
Gehe	Hydrocortisone	12104304	3
Caelo	Hydrocortisone	12104306	11
Caelo	Hydrocortisone	12104305	3
Caelo	Hydrocortisone	12104307	14
Anzag 09.01.2013	Hydrocortisone	12104307	1
Caelo	Hydrocortisone	12104308	7

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix Gotha	Hydrocortisone	12104309	1
Caelo	Hydrocortisone	12119303	10
AHD, 02,12,13	Hydrocortisone	12104309	1
Caelo	Hydrocortisone	12104309	2
Gehe	Hydrocortisone	12119303	1
Fagron	Hydrocortisone	12119303	1
Caelo	Hydrocortisone	12119304	3
Kehr	Hydrocortisone	12167001	1
Caelo	Hydrocortisone	12167001	8
Phönix	Hydrocortisone	12167001	3
Klenk	Hydrocortisone	12167007	1
Phönix	Hydrocortisone	12167010	1
Caesar & Loretz GmbH	Hydrocortisone	12167010	1
Fagron	Hydrocortisone	12I25-N01	3
Caelo	Hydrocortisone	1216707	1
Fagron	Hydrocortisone	12G19-N01	5
Kehr	Hydrocortisone	1219304	1
Noweda	Hydrocortisone	12G19-N01	1
Caelo	Hydrocortisone	12k08-n01	1
Caelo	Hydrocortisone	1306906	1
Caelo	Hydrocortisone	13063501	1
Caelo	Hydrocortisone	13069502	9
Caelo	Hydrocortisone	13069506	8
Caelo	Hydrocortisone	13069507	5
Caesar & Loretz GmbH	Hydrocortisone	13069506	1
AHD	Hydrocortisone	13069507	1
sana corp	Hydrocortisone	13069507	1
Gehe	Hydrocortisone	13069510	1
Caelo	Hydrocortisone	13069509	2
Sanacorp	Hydrocortisone	13069509	1
Phoenix	Hydrocortisone	13341504	1
Fagron	Hydrocortisone	13341504	1
Gehe	Hydrocortisone	13H08-B01-285469	1
Gehe	Hydrocortisone	13H08-B01-285471	1
Fagron	Hydrocortisone	13H08B01285473	1
Fagron	Hydrocortisone	13K22-B01-288284	1
Caesar&lorenz,Phoenix	Hydrocortisone	15021105	1
Caelo	Hydrocortisone	17081301	1
Caelo	Hydrocortisone	2013U-01719	1
Caelo	Hydrocortisone	21101303	1
phönix	Hydrocortisone		2
Caelo	Hydrocortisone	2402211719	1
Caelo	Hydrocortisone	24131-01719	1
Euro OTC	Hydrocortisone	4112A-01719	1
Caelo	Hydrocortisone	3912Q-01719	1
Euro OTC	Hydrocortisone	pzn4914731	1
Caelo	Hydrocortisone	39/AKD17	1
Caelo	Hydrocortisone	9271202	1
Anzag	Hydrocortisone	1107005-02	1
Fagron	Hydrocortisone	12/25-N01	1
Fagron	Hydrocortisone	1204037-01	1
Anzag	Hydrocortisone	12104307	1
Caelo	Hydrocortisone	12167010-3437311151	1

- 55 311 spectra from 335 *Apo-Ident* customers from a total of 20 423 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	567	0	75 311
Type B	0	305	0	81 043
Type C	0	673	17	55 311

The substance/substance group *Hydrocortisone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.9418 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.0328 %)
Type C	100.0000 % (> 99.8622 %)	97.5362 % (> 97.1014 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20006	20006	0.00	40.57
20110	22910	14.10	49.07
21293	22910	4.43	50.56
21461	21899	2.01	40.86
21463	21899	2.70	51.00
21899	21899	0.00	50.56
22829	22838	6.28	50.68
22838	22838	0.00	53.85
22910	22910	0.00	41.85
22928	22910	1.87	44.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydrocortisone acetate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20010-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydrocortisone acetate; Hydrocortisoni acetas; Hydrocortisonum aceticum

Special notes

When selecting the *Hydrocortisone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydrocortisone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydrocortisone a...	82833159	20010	30	I 2009 000 259
Caelo	Hydrocortisone a...	11263917	20602	40	20110920
Euro OTC	Hydrocortisone a...	1209003-01	21295	40	20121108
Euro OTC	Hydrocortisone a...	1508029	21889	40	20150902*
Fagron	Hydrocortisone a...	15A30-B09-307090	22241	40	20150226
Euro OTC	Hydrocortisone a...	1604052	22564	40	20160525*
Euro OTC	Hydrocortisone a...	1209003-01	21295SI	30	20121108
Euro OTC	Hydrocortisone a...	1508029	21889SI	29	20150902*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 289 spectra of 8 reference samples from the substance/substance group *Hydrocortisone acetate*. These samples are listed above in the [calibration samples](#) section.
- 75 589 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 184 spectra of 7 reference samples from the substance/substance group *Hydrocortisone acetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydrocortisone acetate	13291708	21462	60
Euro OTC	Hydrocortisone acetate	1508029	21889 [†]	20
Fagron	Hydrocortisone acetate	15A30-B09-307090	22241 [†]	20
Euro OTC	Hydrocortisone acetate	1209003-01	21295SI [†]	15
Euro OTC	Hydrocortisone acetate	1508029	21889SI [†]	15
Fagron	Hydrocortisone acetate	15A30-B09-307090	22241SI	24
Euro OTC	Hydrocortisone acetate	1604052	22564SI	30

- 81 164 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 905 spectra from 228 *Apo-Ident* customers from 201 batches from the substance/substance group *Hydrocortisone acetate*.

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone acetate	2061401	1
Caelo	Hydrocortisone acetate	3110516	1
Hedinger/Gehe	Hydrocortisone acetate	1112031-02	1
Phönix	Hydrocortisone acetate	1112031-02	1
Euro OTC	Hydrocortisone acetate	1112031-02	5
Caelo	Hydrocortisone acetate	12021502	1
Euro OTC	Hydrocortisone acetate	1205034-01	23
Caelo	Hydrocortisone acetate	1205034-01	4
Euro OTC	Hydrocortisone acetate	12090003-01	2
Großhandel	Hydrocortisone acetate	1209003-01	1
Euro OTC	Hydrocortisone acetate	1209003-01	13
Caelo	Hydrocortisone acetate	1209003-01	5
Pharmacia&Upjohn Comp. ...	Hydrocortisone acetate	1209003-01	1
Phoenix	Hydrocortisone acetate	1209003-01	2
Phoenix Goettin	Hydrocortisone acetate	1209003-01	1
Caelo	Hydrocortisone acetate	12182405	16
Caelo	Hydrocortisone acetate	12330102	7
Phönix	Hydrocortisone acetate	12182405	1
Caelo	Hydrocortisone acetate	12330108	13
Caelo	Hydrocortisone acetate	12330111	8
Fagron	Hydrocortisone acetate	13/31-B07-290062	1
Fagron	Hydrocortisone acetate	13/31-B07-290061	1
Caelo	Hydrocortisone acetate	12330116	12
Caelo	Hydrocortisone acetate	12330112	14
Caesar&Loretz GmbH/Anzag	Hydrocortisone acetate	13155303	1
Caelo	Hydrocortisone acetate	1315503	1
Caelo	Hydrocortisone acetate	13155303	6
Caelo	Hydrocortisone acetate	13155306	6
Caelo	Hydrocortisone acetate	13155308	8
Caelo	Hydrocortisone acetate	13155307	3
Gehe	Hydrocortisone acetate	13155308	1
Caelo	Hydrocortisone acetate	13291704	3
Caelo	Hydrocortisone acetate	13291701	2
Sanacorp	Hydrocortisone acetate	13291704	1
Caelo	Hydrocortisone acetate	13291705	2
Caelo	Hydrocortisone acetate	13291706	11
Caelo	Hydrocortisone acetate	13291707	13
Cealo / Noweda	Hydrocortisone acetate	13291707	1
Herbasinica	Hydrocortisone acetate	13291707	1
Caelo	Hydrocortisone acetate	13291708	8
Gehe	Hydrocortisone acetate	13291708	1
Caelo	Hydrocortisone acetate	13291709	2
Caelo	Hydrocortisone acetate	13291711	6
AHDE 9.09.2014	Hydrocortisone acetate	13291711	1
Caelo	Hydrocortisone acetate	1391704	1
Fagron	Hydrocortisone acetate	13F25-B05-300290	2
Noweda	Hydrocortisone acetate	13G09-N08	1
Caelo	Hydrocortisone acetate	13G09-N08	1
gehe	Hydrocortisone acetate	13G09-N08	1
Fagron	Hydrocortisone acetate	13G09-N08	4
Fagron	Hydrocortisone acetate	13J31-B07-290062	1
Fagron	Hydrocortisone acetate	13J31B07290061	1
Fagron	Hydrocortisone acetate	13J31-B07-290061	2
Fagron	Hydrocortisone acetate	13J31-B07	2
Euro OTC	Hydrocortisone acetate	1404017-01	7
Euro/Gehe	Hydrocortisone acetate	1404017-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Hydrocortisone acetate	1404017-02	4
Euro OTC	Hydrocortisone acetate	140401702	1
Apomix/Noweda	Hydrocortisone acetate	1404017-02	1
Caelo	Hydrocortisone acetate	14043901	10
Caelo	Hydrocortisone acetate	14043902	7
Bombastus	Hydrocortisone acetate	14043902	1
Caelo	Hydrocortisone acetate	14043903	8
GEHE 03.07.2014	Hydrocortisone acetate	14043903	1
Caelo	Hydrocortisone acetate	14043904	13
Caelo	Hydrocortisone acetate	14043905	5
Gehe	Hydrocortisone acetate	14043905	1
Fagron	Hydrocortisone acetate	14043906	1
Caelo	Hydrocortisone acetate	14043906	8
Gehe	Hydrocortisone acetate	14043906	3
Caelo	Hydrocortisone acetate	14043907	11
Gehe	Hydrocortisone acetate	14043907	1
Caelo	Hydrocortisone acetate	14043908	2
Euro OTC	Hydrocortisone acetate	1409005-01	12
Euro/ Sanacorp	Hydrocortisone acetate	1409005-01	1
Phönix/Lihua	Hydrocortisone acetate	1409005-01	1
Euro OTC	Hydrocortisone acetate	1409005-02	3
Caelo	Hydrocortisone acetate	14144803	7
Caelo	Hydrocortisone acetate	14144802	1
Caelo	Hydrocortisone acetate	14144804	5
Phönix	Hydrocortisone acetate	14144804	1
Fagron	Hydrocortisone acetate	14144804	1
Caelo	Hydrocortisone acetate	14144805	14
Caelo	Hydrocortisone acetate	14144806	11
Caelo	Hydrocortisone acetate	14144807	7
Caelo	Hydrocortisone acetate	1430102	1
Caelo	Hydrocortisone acetate	14301401	13
Caelo	Hydrocortisone acetate	14301402	4
Caelo	Hydrocortisone acetate	14301403	2
Noweda 17.07.2015	Hydrocortisone acetate	14301403	1
Caelo	Hydrocortisone acetate	14301404	4
Caelo	Hydrocortisone acetate	14301405	11
Caesar&Loretz GmbH/Anzag	Hydrocortisone acetate	14301405	2
Caelo	Hydrocortisone acetate	14301406	6
Caelo	Hydrocortisone acetate	14301407	9
Caelo	Hydrocortisone acetate	14301408	6
Fagron	Hydrocortisone acetate	14A13-B04	1
Fagron	Hydrocortisone acetate	14A13-B04-294158	2
Fagron	Hydrocortisone acetate	14I16-B01-300292	2
Euro OTC	Hydrocortisone acetate	1501035-01	6
Euro OTC	Hydrocortisone acetate	150103501	2
Euro OTC	Hydrocortisone acetate	1502000801	1
Euro OTC	Hydrocortisone acetate	1505008	1
Euro OTC	Hydrocortisone acetate	1505008-01	20
Phoenix	Hydrocortisone acetate	1505008-01	1
Caelo	Hydrocortisone acetate	1505008-01	2
Euro OTC	Hydrocortisone acetate	150500801	1
Caesar & Loretz GmbH Hi...	Hydrocortisone acetate	1505008-01	1
Caelo	Hydrocortisone acetate	15067003	6
Caelo	Hydrocortisone acetate	15067004	8
Caelo	Hydrocortisone acetate	15067005	12
Caelo	Hydrocortisone acetate	15067006	4
Caelo	Hydrocortisone acetate	15067011	3
Caelo	Hydrocortisone acetate	15067010	2
Caelo	Hydrocortisone acetate	15067013	3
Euro OTC	Hydrocortisone acetate	1508029-01	13

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Europh-Gehe	Hydrocortisone acetate	1508029-01	1
Euro/Alliance Healthcare	Hydrocortisone acetate	1508029-01	1
Caelo	Hydrocortisone acetate	15356901	5
Caelo	Hydrocortisone acetate	15356902	12
Caelo	Hydrocortisone acetate	15356903	9
Caesar&Loretz GmbH/AHD	Hydrocortisone acetate	15356903	1
Caelo	Hydrocortisone acetate	15356904	4
Bombastus	Hydrocortisone acetate	15356903	1
Großhandel	Hydrocortisone acetate	157000	1
Phoenix	Hydrocortisone acetate	1568/05131813	1
Caelo	Hydrocortisone acetate	15A07-B03-306545	1
Fagron	Hydrocortisone acetate	15A03-B09-307133	1
Fagron	Hydrocortisone acetate	15A30-B09-307133	3
Fagron	Hydrocortisone acetate	15A30-B09-307090	1
Phoenix	Hydrocortisone acetate	15A30-B09	1
Caelo	Hydrocortisone acetate	15H24-B01-314236	1
Fagron	Hydrocortisone acetate	15h24-b01-314236	1
Phoenix	Hydrocortisone acetate	15J28-B12	1
Fagron	Hydrocortisone acetate	15H24-B01-316480	1
Caelo	Hydrocortisone acetate	16004402	4
Fagron	Hydrocortisone acetate	16004402	1
Caelo	Hydrocortisone acetate	16004405	5
Caelo	Hydrocortisone acetate	16004403	3
Caelo	Hydrocortisone acetate	16004406	6
Euro OTC	Hydrocortisone acetate	16004406	1
Caelo	Hydrocortisone acetate	16004407	8
Caelo	Hydrocortisone acetate	16004408	4
Euro OTC	Hydrocortisone acetate	1604052-01	3
Caelo	Hydrocortisone acetate	16095404	1
Caelo	Hydrocortisone acetate	16095405	2
Caesar & Loretz GmbH Hi...	Hydrocortisone acetate	16095404	1
Caesar & Loretz	Hydrocortisone acetate	16095404	1
Caelo	Hydrocortisone acetate	16095406	2
Caelo	Hydrocortisone acetate	27091403	1
Caelo	Hydrocortisone acetate	28071508	1
Caelo	Hydrocortisone acetate	CH13291705	1
Gehe	Hydrocortisone acetate	HC0024	1
Fagron	Hydrocortisone acetate	NCEHAC130201	1
Fagron	Hydrocortisone acetate	NCEHAC120701	1
Lihua/phönix	Hydrocortisone acetate	K06A20140801M	1
Fagron	Hydrocortisone acetate	M39171	1
Caelo	Hydrocortisone acetate	P156/14	1
Caelo	Hydrocortisone acetate	213E-01719	1
Euro OTC	Hydrocortisone acetate	911I-01718	1
Fagron	Hydrocortisone acetate	8563642	1
Euro OTC	Hydrocortisone acetate	1010025-01	1
Caelo	Hydrocortisone acetate	7051303	1
Caelo	Hydrocortisone acetate	10083911	1
Caelo	Hydrocortisone acetate	10301913	1
Fagron	Hydrocortisone acetate	11/01-N05	1
Phönix	Hydrocortisone acetate	1107004-01	1
Sanacorp	Hydrocortisone acetate	1107004-03	1
Euro OTC	Hydrocortisone acetate	1107004-03	5
Euro OTC	Hydrocortisone acetate	1107004-02	2
EuRho	Hydrocortisone acetate	1107004-03	1
ANZAG 16.04.2012	Hydrocortisone acetate	1107004-03	1
Phönix	Hydrocortisone acetate	110700403	1
Gehe	Hydrocortisone acetate	11098607	1
Caelo	Hydrocortisone acetate	11098604	1
Caelo	Hydrocortisone acetate	11098611	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Hydrocortisone acetate	1112031-01	13
Fagron	Hydrocortisone acetate	1112031	1
Caelo	Hydrocortisone acetate	11098612	1
Caelo	Hydrocortisone acetate	11098615	1
Klenk	Hydrocortisone acetate	1112031-01	1
Phönix	Hydrocortisone acetate	1112031-01	1
Phönix, 27.04.2013	Hydrocortisone acetate	1112031-01	1
Anzag 01.02.2013	Hydrocortisone acetate	1112031-02	1
Noweda	Hydrocortisone acetate	1112031-02	1
Großhandel	Hydrocortisone acetate	1112031-02	1
Anzag	Hydrocortisone acetate	1112031-02	2
Phoenix 02.05.2013	Hydrocortisone acetate	1112031-02	1
Caelo	Hydrocortisone acetate	11263902	1
Caelo	Hydrocortisone acetate	1113E-01718	1
Caelo	Hydrocortisone acetate	1112031-02	1
Caelo	Hydrocortisone acetate	11263905	1
Caelo	Hydrocortisone acetate	11263906	1
Caelo	Hydrocortisone acetate	11263913	2
Caelo	Hydrocortisone acetate	11263911	1
Kehr	Hydrocortisone acetate	11263906	1
Noweda	Hydrocortisone acetate	11263912	1
Anzag 17.03.2012	Hydrocortisone acetate	11263905	1
Caelo	Hydrocortisone acetate	11263907	1
Sanacorp	Hydrocortisone acetate	11263913	1
Kehr	Hydrocortisone acetate	11263914	1
Caelo	Hydrocortisone acetate	11263914	1
Caelo	Hydrocortisone acetate	11263915	2
Caelo	Hydrocortisone acetate	11263916	4
Caelo	Hydrocortisone acetate	11263917	3
Noweda	Hydrocortisone acetate	11F24-N12	1
Caelo	Hydrocortisone acetate	12008402	4
Caelo	Hydrocortisone acetate	12008403	2
Gehe	Hydrocortisone acetate	12008405	1
Caelo	Hydrocortisone acetate	12008404	3
Caelo	Hydrocortisone acetate	12008405	5
Caelo	Hydrocortisone acetate	12008411	1
Noweda/ Pharmacia & Upj...	Hydrocortisone acetate	1205034-01	1
Großhandel	Hydrocortisone acetate	1205034-01	5
Phoenix	Hydrocortisone acetate	1205034-01	1
AHD, 23.10.2013	Hydrocortisone acetate	1205034-01	1
Gehe	Hydrocortisone acetate	1205034-01	1
Phönix	Hydrocortisone acetate	1205034-01	1
Euro OTC	Hydrocortisone acetate	120503401	3
Caelo	Hydrocortisone acetate	1213M-01718	1
Caelo	Hydrocortisone acetate	12182402	12
Euro OTC	Hydrocortisone acetate	120900301	1
Phoenix	Hydrocortisone acetate	12182402	1
Caelo	Hydrocortisone acetate	12182403	6
Caelo	Hydrocortisone acetate	12182404	21
Herbasinica	Hydrocortisone acetate	12182403	1
Fagron	Hydrocortisone acetate	12182404	1
Kehr	Hydrocortisone acetate	12182405	3
Caesar&loretz,Phoenix	Hydrocortisone acetate	12182405	1
Caesar & Loretz GmbH	Hydrocortisone acetate	12182405	1
Phönix Gotha	Hydrocortisone acetate	12182405	1
Nachprüfung	Hydrocortisone acetate		1
Caelo	Hydrocortisone acetate	12182408	2
Caelo	Hydrocortisone acetate	12183403	1
Caelo	Hydrocortisone acetate	12248501	1
Phönix Gotha	Hydrocortisone acetate	12330103	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydrocortisone acetate	12330103	9
Caesar&lorenz,Phoenix	Hydrocortisone acetate	12330103	1
Caelo	Hydrocortisone acetate	12330104	11
Sanacorp	Hydrocortisone acetate	12330103	1
Caelo	Hydrocortisone acetate	12330105	4
Caelo	Hydrocortisone acetate	12330106	5
Caelo	Hydrocortisone acetate	12330107	8
Fagron	Hydrocortisone acetate	12330107	1
Pönix 26.06.2013	Hydrocortisone acetate	12330107	1
Phoenix	Hydrocortisone acetate	12330107	1
Phönix Gotha	Hydrocortisone acetate	12330108	1
Caelo	Hydrocortisone acetate	12330110	4
Caelo	Hydrocortisone acetate	12330114	1
Caelo	Hydrocortisone acetate	12330113	3
Caelo	Hydrocortisone acetate	1233016	1
Gehe	Hydrocortisone acetate	1233015	1
Fagron	Hydrocortisone acetate	12A13-N02	1
Fagron	Hydrocortisone acetate	12K15-N04	6
Phönix	Hydrocortisone acetate	12A13-N02	1
FARGON	Hydrocortisone acetate	12k15-n04	1
Phönix	Hydrocortisone acetate	12K15-No4	1
Caelo	Hydrocortisone acetate	1315304	1
Caelo	Hydrocortisone acetate	13155302	7
Sanacorp	Hydrocortisone acetate	13155302	2
gehe	Hydrocortisone acetate	13155302	2
Caelo	Hydrocortisone acetate	13155304	6
Caeolo/Noweda	Hydrocortisone acetate	13155303	1
Caelo	Hydrocortisone acetate	131553080	1
Fagron	Hydrocortisone acetate	13155311	1
Fagron	Hydrocortisone acetate	13A03-N04	5
Fagron	Hydrocortisone acetate	13B25-N04	2
Fagron	Hydrocortisone acetate	13E31-N02	3
Fagron	Hydrocortisone acetate	13E31-No2	1
Sanacorp	Hydrocortisone acetate	14043903	1
Caelo	Hydrocortisone acetate	1406211718	1
Caelo	Hydrocortisone acetate	15061207	1
Euro OTC	Hydrocortisone acetate	140900502	1
Caelo	Hydrocortisone acetate	17011402	1
Bombastus	Hydrocortisone acetate	2712M01718	1
Caelo	Hydrocortisone acetate	20220911-3	1
Caelo	Hydrocortisone acetate	2612M01718	1
Caelo	Hydrocortisone acetate	18011304	1
Caelo	Hydrocortisone acetate	27091307	1
Caelo	Hydrocortisone acetate		1
Caelo	Hydrocortisone acetate	25101201	1
Caelo	Hydrocortisone acetate	3110491	1
Euro OTC	Hydrocortisone acetate	508029-01	1
Fagron	Hydrocortisone acetate	3613A-01718	1
Phönix	Hydrocortisone acetate	AKD8	1
Noweda	Hydrocortisone acetate	HCA003/0611	1
Euro OTC	Hydrocortisone acetate	HCAZ11004K	2
Fagron	Hydrocortisone acetate	12008411	3
AHD	Hydrocortisone acetate	1205034-01	1
Caelo	Hydrocortisone acetate	12330111-3507411061	1
Fagron	Hydrocortisone acetate	12330114	1

- 55 096 spectra from 335 *Apo-Ident* customers from a total of 20 415 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	289	0	75 589
Type B	0	184	0	81 164
Type C	0	815	90	55 096

The substance/substance group *Hydrocortisone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.9239 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.7391 %)
Type C	100.0000 % (> 99.8622 %)	90.0552 % (> 89.7238 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20010	20010	0.00	22.63
20602	21889	3.87	24.06
21295	21889	3.69	30.13
21889	21889	0.00	27.17
22241	21889	4.35	30.74
22564	22564	0.00	33.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydrocortisone butyrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21531-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydrocortisone butyrate; Hydrocortisoni butyras micronisatum

Special notes

When selecting the *Hydrocortisone butyrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydrocortisone butyrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hydrocortisone b...	13I26-N01	21531	40	AR-15-FG-000944-01
Fagron	Hydrocortisone b...	14D23-B01-296716	21723	30	20140509
Fagron	Hydrocortisone b...	13I26-N01	21797	40	20130920
Fagron	Hydrocortisone b...	13I26-N01	21797SI	30	20130920

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 140 spectra of 4 reference samples from the substance/substance group *Hydrocortisone butyrate*. These samples are listed above in the [calibration samples](#) section.
- 75 738 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 133 spectra of 5 reference samples from the substance/substance group *Hydrocortisone butyrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hydrocortisone butyrate	13I26-N01	21531 [†]	20
Fagron	Hydrocortisone butyrate	14D23-B01-296716	21723 [†]	30
Fagron	Hydrocortisone butyrate	13I26-N01	21797 [†]	20
Fagron	Hydrocortisone butyrate	14D23-B01-296716	21723SI	48
Fagron	Hydrocortisone butyrate	13I26-N01	21797SI [†]	15

- 81 215 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Hydrocortisone butyrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydrocortisone butyrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydrocortisone butyrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	140	0	75 738
Type B	0	133	0	81 215
Type C	0	0	0	56 001

The substance/substance group *Hydrocortisone butyrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.7143 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.4887 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21531	21531	0.00	30.93
21723	21531	9.37	29.13
21797	21531	4.42	33.32

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydroquinone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20091-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydroquinone; Hydrochinonum

Special notes

When selecting the *Hydroquinone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydroquinone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroquinone	12288505	20884	40	20121015
Caelo	Hydroquinone	14026904	21468	40	20140122
Caelo	Hydroquinone	14281501	21791	40	AR-15-FG-008058-01
Caelo	Hydroquinone	14280110	21923	40	20141017
Caelo	Hydroquinone	15057004	21975	40	20150306
Caelo	Hydroquinone	15057001	22324	40	20150306
Caelo	Hydroquinone	15057001	22351	40	20150306

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Hydroquinone*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Hydroquinone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydroquinone	14026904	21468 [†]	20
Caelo	Hydroquinone	14281501	21791 [†]	20
Caelo	Hydroquinone	14280110	21923 [†]	20
Caelo	Hydroquinone	15057004	21975 [†]	20
Caelo	Hydroquinone	15057001	22324 [†]	20
Caelo	Hydroquinone	15057001	22351 [†]	20

- 81 228 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 121 spectra from 79 *Apo-Ident* customers from 39 batches from the substance/substance group *Hydroquinone*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Hydroquinone	11163905	4
Caelo	Hydroquinone	13105408	6
Caelo	Hydroquinone	13105405	6
Caelo	Hydroquinone	12288502	2
Alliance Healthcare	Hydroquinone	12288503	2
Caelo	Hydroquinone	14026902	5
Phönix	Hydroquinone	13105408	1
Apomix/Noweda	Hydroquinone	13105408	1
Caelo	Hydroquinone	14180401	1
Caelo	Hydroquinone	14180406	3
Caelo	Hydroquinone	14180410	1
Caelo	Hydroquinone	14280104	2
Caelo	Hydroquinone	14280105	1
Caelo	Hydroquinone	14280110	1
Phoenix Goettin	Hydroquinone	14281501	1
Caelo	Hydroquinone	14281501	6
Caelo	Hydroquinone	14281507	4
Caelo	Hydroquinone	15057001	3
Caelo	Hydroquinone	15057004	4
Euro/Sanacorp	Hydroquinone	15057004	1
Caelo	Hydroquinone	15057010	6
Caelo	Hydroquinone	16051502	1
Fagron	Hydroquinone		1
Caelo	Hydroquinone	18031403	1
Caelo	Hydroquinone		1
Caelo	Hydroquinone	10145101	1
Caelo	Hydroquinone	10145103	1
Caelo	Hydroquinone	10145113	2
Caelo	Hydroquinone	11163907	5
Caesar & Loretz GmbH, 4...	Hydroquinone	11163912	1
Caelo	Hydroquinone	11163912	4
Caelo	Hydroquinone	11163912/Int312052	1
Caelo	Hydroquinone	1163902	1
Caelo	Hydroquinone	12156705	4
Sanacorp	Hydroquinone	12156703	1
Gehe	Hydroquinone	12156706	2
Anzag 22.02.2013	Hydroquinone	12288503	1
Caelo	Hydroquinone	12288503	2
Caelo	Hydroquinone	12288505	7
Caelo	Hydroquinone	12156706	1
Anzag	Hydroquinone	12288505	2
A.H. 14.06.13 ek: 3,97EUR	Hydroquinone	12288505	1
Caelo	Hydroquinone	13105402	9
AHD	Hydroquinone	13105405	1
Caesar & Loretz GmbH	Hydroquinone	13105405	1
Caelo	Hydroquinone	14121202	1
Caelo	Hydroquinone	20200712-3	1
Anzag	Hydroquinone	11163912	1
14026902	Hydroquinone	InterneCharge1214Q	1
Caelo	Hydroquinone	72265417	1
Anzag	Hydroquinone	12156705	1
Caelo	Hydroquinone	12285201	1
Caelo	Hydroquinone	1228503	1

- 55 880 spectra from 335 *Apo-Ident* customers from a total of 20 573 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydroquinone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroquinone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	120	0	81 228
Type C	0	120	1	55 880

The substance/substance group *Hydroquinone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	99.1736 % (> 96.6942 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20884	21791	2.81	25.02
21468	21791	3.39	22.66
21791	21791	0.00	23.33
21923	21791	3.12	23.39
21975	21791	1.59	22.43
22324	21791	1.76	22.99
22351	21791	3.56	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 1.3-2017-02

Validated substance/substance group **Hydroxyethylcelluloses (300 / 9000 mPa · s)**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20791-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydroxyethylcelluloses (300 / 9000 mPa · s); Hydroxyethyl cellulose (300 mPa · s); Hydroxyethyl cellulose (9000 mPa · s); Hydroxyethylcellulosum G 300; Hydroxyethylcellulosum H 300; Hydroxyethylcellulosum HX

Special notes

When selecting the *Hydroxyethylcelluloses (300 / 9000 mPa · s)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydroxyethylcelluloses (300 / 9000 mPa · s)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxyethyl cel...	12249204	20791	40	20120830
Euro OTC	Hydroxyethyl cel...	1110024-04	20792	40	20120110
Caelo	Hydroxyethyl cel...	03936475	20862	20	20121001
Fagron	Hydroxyethyl cel...	13H22-N11	20908	40	20130826

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxyethyl cel...	13378506	21365	40	1507205
Caelo	Hydroxyethyl cel...	14352504	21792	40	AR-15-FG-009318-01
Caelo	Hydroxyethyl cel...	161006	22459	40	20160426*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 260 spectra of 7 reference samples from the substance/substance group *Hydroxyethylcelluloses* (300 / 9000 mPa · s). These samples are listed above in the [calibration samples](#) section.
- 75 618 spectra from a total of 1569 batches from further 382 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 290 spectra of 8 reference samples from the substance/substance group *Hydroxyethylcelluloses* (300 / 9000 mPa · s).

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Hydroxyethyl cellulose (300 ...	pending	20146	40
Caelo	Hydroxyethyl cellulose (300 ...	9312308	20184	50
Euro OTC	Hydroxyethyl cellulose (300 ...	1101022-02	20238	40
Caelo	Hydroxyethyl cellulose (9000...	14352504	21792 [†]	20
Caelo	Hydroxyethyl cellulose (300 ...	161006	22459 [†]	20
Euro OTC	Hydroxyethyl cellulose (300 ...	1606030	22698	40
Caelo	Hydroxyethyl cellulose (9000...	16012909	22809	40
Euro OTC	Hydroxyethyl cellulose (300 ...	1610039	22870	40

- 81 058 spectra from a total of 1940 batches from further 619 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 630 spectra from 203 *Apo-Ident* customers from 183 batches from the substance/substance group *Hydroxyethylcelluloses (300 / 9000 mPa · s)*.

Supplier	Substance	Batch	Spectra
Euro OTC	Hydroxyethyl cellulose (300 ...	3081603	1
Gutenberg-Apotheke	Hydroxyethyl cellulose (300 ...	10019402	2
Euro OTC	Hydroxyethyl cellulose (300 ...	914E-03301	1
Gutenberg-Apotheke	Hydroxyethyl cellulose (9000...	11048105	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1110024-04	20
Caelo	Hydroxyethyl cellulose (9000...	12274702	1
Nachprüfung 2797	Hydroxyethyl cellulose (300 ...	12249202	1
Caelo	Hydroxyethyl cellulose (300 ...	12156907	11
Caelo	Hydroxyethyl cellulose (300 ...	12369711	4
Euro OTC	Hydroxyethyl cellulose (300 ...	1304008-01	27
Euro OTC	Hydroxyethyl cellulose (9000...	1304008-02	1
Gehe/EuRho	Hydroxyethyl cellulose (300 ...	1304008-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1304008-02	20
Caelo	Hydroxyethyl cellulose (300 ...	13041502	1
Ashland / Phoenix	Hydroxyethyl cellulose (300 ...	13090020-01	1
Ashland / Noweda	Hydroxyethyl cellulose (300 ...	1304008-02	2
Caelo	Hydroxyethyl cellulose (300 ...	1309020-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1309020-01	18
Fagron	Hydroxyethyl cellulose (300 ...	1309020-01	2
Caelo	Hydroxyethyl cellulose (300 ...	130902001	1
Großhandel	Hydroxyethyl cellulose (300 ...	1309020-01	1
Caelo	Hydroxyethyl cellulose (9000...	1309020-01	1
Sanacorp/Phoenix	Hydroxyethyl cellulose (300 ...	1309020-01	1
Phoenix 10.07.2014	Hydroxyethyl cellulose (300 ...	1309020-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1309020-02	4
Alliance Healthcare/Hed...	Hydroxyethyl cellulose (300 ...	1309020-02	1
Fagron	Hydroxyethyl cellulose (9000...	130902002	1
Caelo	Hydroxyethyl cellulose (300 ...	1309020-02	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1309020-03	9
Caelo	Hydroxyethyl cellulose (300 ...	1315306	1
Euro OTC	Hydroxyethyl cellulose (300 ...	13099020-01	1
Caelo	Hydroxyethyl cellulose (300 ...	13153505	10
Caelo	Hydroxyethyl cellulose (300 ...	13153511	7
Gehe 24.06.2014	Hydroxyethyl cellulose (300 ...	13153505	1
Caelo	Hydroxyethyl cellulose (9000...	13182702	6
Noweda	Hydroxyethyl cellulose (300 ...	13153511	1
Caelo	Hydroxyethyl cellulose (300 ...	133785	1
Caelo	Hydroxyethyl cellulose (300 ...	13378502	5
Caelo	Hydroxyethyl cellulose (300 ...	1337807	1
Caelo	Hydroxyethyl cellulose (300 ...	1337808	1
Caelo	Hydroxyethyl cellulose (300 ...	13378507	7
gehe	Hydroxyethyl cellulose (300 ...	13378507	2
Caelo	Hydroxyethyl cellulose (300 ...	13378508	3
Caelo	Hydroxyethyl cellulose (300 ...	13378510	2
Caelo	Hydroxyethyl cellulose (300 ...	13378515	3
Caelo	Hydroxyethyl cellulose (300 ...	13378516	2
Caelo	Hydroxyethyl cellulose (300 ...	13H22-N11	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethyl cellulose (300 ...	13378524	1
Th. Geyer	Hydroxyethyl cellulose (300 ...	13L04-B03	1
Caelo	Hydroxyethyl cellulose (300 ...	13378518	1
Phönix	Hydroxyethyl cellulose (300 ...	13L04-B03-289115	2
Fagron	Hydroxyethyl cellulose (300 ...	13L04-B03	2
Fagron	Hydroxyethyl cellulose (300 ...	14/04-B05-300231	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1406017	1
Caelo	Hydroxyethyl cellulose (300 ...	1406017-01	3
Euro OTC	Hydroxyethyl cellulose (9000...	1406017-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1406017-01	25
Euro OTC	Hydroxyethyl cellulose (300 ...	1406017-02	23
Caelo	Hydroxyethyl cellulose (300 ...	1406017-02	2
Euro OTC	Hydroxyethyl cellulose (300 ...	1406017-03	1
Caelo	Hydroxyethyl cellulose (9000...	14095905	1
Caelo	Hydroxyethyl cellulose (9000...	14095901	1
Caelo	Hydroxyethyl cellulose (9000...	14095911	3
Caelo	Hydroxyethyl cellulose (9000...	14352508	1
Caelo	Hydroxyethyl cellulose (300 ...	14256002	2
Fagron	Hydroxyethyl cellulose (300 ...	14D04-B02	2
Caelo	Hydroxyethyl cellulose (9000...	14352510	2
Caelo	Hydroxyethyl cellulose (9000...	14352515	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1496017-02	1
Fagron	Hydroxyethyl cellulose (300 ...	14D04-B02-293558	2
Fagron	Hydroxyethyl cellulose (300 ...	14D04B02293555	1
Fagron	Hydroxyethyl cellulose (300 ...	14F04-B06-295130	1
Phoenix Goettin	Hydroxyethyl cellulose (300 ...	14F04-B06-295130	1
Fagron	Hydroxyethyl cellulose (300 ...	14F04-B06-29784K137	1
Fagron	Hydroxyethyl cellulose (300 ...	14F04-B06-297846	1
Fagron	Hydroxyethyl cellulose (300 ...	14I04-B05-300224	2
Fagron	Hydroxyethyl cellulose (300 ...	14I04-B05	2
Fagron	Hydroxyethyl cellulose (300 ...	14i04-b05-309049	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1500418-02	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1504018-01	7
Euro OTC	Hydroxyethyl cellulose (300 ...	1504018-02	14
Euro OTC	Hydroxyethyl cellulose (300 ...	1504018-03	6
Euro OTC	Hydroxyethyl cellulose (300 ...	150418-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1504019-02	1
Caelo	Hydroxyethyl cellulose (300 ...	15086405	5
Caelo	Hydroxyethyl cellulose (300 ...	15086403	3
Caelo	Hydroxyethyl cellulose (300 ...	15086504	2
Caelo	Hydroxyethyl cellulose (300 ...	15086407	3
Caelo	Hydroxyethyl cellulose (300 ...	15086503	1
Fagron	Hydroxyethyl cellulose (300 ...	15086407	1
Caelo	Hydroxyethyl cellulose (300 ...	15086408	1
Caelo	Hydroxyethyl cellulose (300 ...	15086506	1
Caelo	Hydroxyethyl cellulose (300 ...	15086505	1
Caelo	Hydroxyethyl cellulose (300 ...	15086507	1
Caelo	Hydroxyethyl cellulose (9000...	15199501	3
Jenne	Hydroxyethyl cellulose (9000...	15199501	1
Fagron	Hydroxyethyl cellulose (300 ...	15B04-B03-312859	2
Fagron	Hydroxyethyl cellulose (300 ...	15B04-B03-315495	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1606030-01	8
Fagron	Hydroxyethyl cellulose (300 ...	15E07-B05-316511	1
Caelo	Hydroxyethyl cellulose (300 ...	1606030-01	2
Caelo	Hydroxyethyl cellulose (300 ...	160603001	1
Caelo	Hydroxyethyl cellulose (300 ...	16100606	5
Caelo	Hydroxyethyl cellulose (300 ...	16100604	1
Ebert & Jacobi 02.08.2016	Hydroxyethyl cellulose (300 ...	16100606	1
Caelo	Hydroxyethyl cellulose (300 ...	16100605	1
Phönix	Hydroxyethyl cellulose (300 ...	16100606	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethyl cellulose (300 ...	16100607	1
Caelo	Hydroxyethyl cellulose (300 ...	16100617	2
Caelo	Hydroxyethyl cellulose (300 ...	19051406	1
Caelo	Hydroxyethyl cellulose (300 ...	16100612	2
Fagron	Hydroxyethyl cellulose (300 ...	2178	1
Fagron	Hydroxyethyl cellulose (300 ...	16E09-B05-321320	2
Euro OTC	Hydroxyethyl cellulose (300 ...	1909020-02	1
Caelo	Hydroxyethyl cellulose (300 ...	220914PML02	1
Caelo	Hydroxyethyl cellulose (300 ...	4815A-03301	1
Euro OTC	Hydroxyethyl cellulose (300 ...	K1371	2
Fagron	Hydroxyethyl cellulose (300 ...	K1373	2
Ashland Industries/Anzag	Hydroxyethyl cellulose (300 ...	L1891	1
Euro OTC	Hydroxyethyl cellulose (9000...	1110024-01	2
Euro OTC	Hydroxyethyl cellulose (9000...	2402212528	1
Caelo	Hydroxyethyl cellulose (300 ...	11266305	5
Caelo	Hydroxyethyl cellulose (300 ...	11186202	2
Fagron	Hydroxyethyl cellulose (300 ...	12C27-N01	1
Euro OTC	Hydroxyethyl cellulose (9000...	314Q3301	1
EuRho	Hydroxyethyl cellulose (300 ...	3081202	1
Caelo	Hydroxyethyl cellulose (300 ...	213I-03301	1
Caelo	Hydroxyethyl cellulose (300 ...	8051305	1
Euro OTC	Hydroxyethyl cellulose (300 ...	80616-3	1
Caelo	Hydroxyethyl cellulose (300 ...	10019408	2
Euro OTC	Hydroxyethyl cellulose (300 ...	1007018-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	110505401	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1101022-02	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1110024-01	5
Euro OTC	Hydroxyethyl cellulose (300 ...	1108027-01	2
Caelo	Hydroxyethyl cellulose (300 ...	1110024-01	1
Noweda	Hydroxyethyl cellulose (300 ...	1108027-01	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1110024-02	12
Phönix, 21.06.2012	Hydroxyethyl cellulose (300 ...	1110024-02	2
Euro OTC	Hydroxyethyl cellulose (300 ...	1110024-03	19
Anzag	Hydroxyethyl cellulose (300 ...	1110024-03	3
Caelo	Hydroxyethyl cellulose (300 ...	1110024-02	1
Gehe	Hydroxyethyl cellulose (300 ...	1110024-03	1
Sanacorp	Hydroxyethyl cellulose (300 ...	1110024-03	1
Europharm/Otto	Hydroxyethyl cellulose (300 ...	1110024-03	1
Phönix	Hydroxyethyl cellulose (300 ...	111002403	1
EuRho	Hydroxyethyl cellulose (300 ...	1110024-03	1
Caelo	Hydroxyethyl cellulose (300 ...	1110024-04	1
Holdermann	Hydroxyethyl cellulose (300 ...	1110024-04	1
Gehe	Hydroxyethyl cellulose (300 ...	111002404	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1110024-04-336431909	1
Euro OTC	Hydroxyethyl cellulose (300 ...	111024-02	1
Euro OTC	Hydroxyethyl cellulose (9000...	11110024-03	1
Caelo	Hydroxyethyl cellulose (300 ...	1113E-03301	1
Caelo	Hydroxyethyl cellulose (300 ...	11186221	2
Caelo	Hydroxyethyl cellulose (9000...	11304601	1
Fagron	Hydroxyethyl cellulose (300 ...	11E09-N08	1
Caelo	Hydroxyethyl cellulose (9000...	11304620	4
Caelo	Hydroxyethyl cellulose (300 ...	11266316	1
Caelo	Hydroxyethyl cellulose (9000...	11304619	1
Caelo	Hydroxyethyl cellulose (300 ...	11266317	1
Caelo	Hydroxyethyl cellulose (9000...	11304614	1
Fagron	Hydroxyethyl cellulose (300 ...	11I02-N02	2
Fagron	Hydroxyethyl cellulose (300 ...	1212N-03301	2
Fagron	Hydroxyethyl cellulose (300 ...	11I02-N12	1
Erika apotheke	Hydroxyethyl cellulose (300 ...	12156901	1
Caelo	Hydroxyethyl cellulose (300 ...	12156901	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Hydroxyethyl cellulose (300 ...	12156902	2
Caelo	Hydroxyethyl cellulose (300 ...	12156902	1
Noweda	Hydroxyethyl cellulose (300 ...	12156907	1
Caelo	Hydroxyethyl cellulose (300 ...	12156915	1
Caelo	Hydroxyethyl cellulose (300 ...	12249202	3
Gehe	Hydroxyethyl cellulose (300 ...	12156908	1
Caelo	Hydroxyethyl cellulose (300 ...	122492014	1
Caelo	Hydroxyethyl cellulose (300 ...	12156908	3
Caelo	Hydroxyethyl cellulose (300 ...	12249204	3
Caelo	Hydroxyethyl cellulose (300 ...	12249205	4
Caelo	Hydroxyethyl cellulose (300 ...	12249216	7
Caesar & Loretz GmbH D-...	Hydroxyethyl cellulose (9000...	12274702	1
Fagron	Hydroxyethyl cellulose (300 ...	12345	2
Caelo	Hydroxyethyl cellulose (9000...	12274710	2
Caelo	Hydroxyethyl cellulose (300 ...	12369704	10
Caelo	Hydroxyethyl cellulose (300 ...	12369713	3
Caelo	Hydroxyethyl cellulose (300 ...	12369717	2
Phönix	Hydroxyethyl cellulose (300 ...	12369704	1
Phönix	Hydroxyethyl cellulose (300 ...	12369711	1
Gehe	Hydroxyethyl cellulose (300 ...	12369718	1
Fagron	Hydroxyethyl cellulose (300 ...	12A09-N06	3
Fagron	Hydroxyethyl cellulose (300 ...	12C27-N01	1
Fagron	Hydroxyethyl cellulose (9000...	12C02-N06	1
Euro OTC	Hydroxyethyl cellulose (300 ...	130400801	1
Fagron	Hydroxyethyl cellulose (300 ...	12H02-N06	2
Euro OTC	Hydroxyethyl cellulose (300 ...	13040008-02	1
Sanacorp	Hydroxyethyl cellulose (300 ...	12H02-N06	1
Euroo/Phoenix	Hydroxyethyl cellulose (300 ...	1304008-01	1
Caelo	Hydroxyethyl cellulose (300 ...	1304008-01	1
AHD, 28.11.13	Hydroxyethyl cellulose (300 ...	1304008-01	1
	Hydroxyethyl cellulose (300 ...	1304008-01	1
Caelo	Hydroxyethyl cellulose (300 ...	1304008-02	3
Alliance Health 27.12.2...	Hydroxyethyl cellulose (300 ...	1304008-02	1
Euro OTC	Hydroxyethyl cellulose (300 ...	130902001	1
Ashland/Sanacorp	Hydroxyethyl cellulose (300 ...	1309020-01	1
Phonix	Hydroxyethyl cellulose (300 ...	1309020-01	1
Caelo	Hydroxyethyl cellulose (300 ...	13153501	8
Gehe	Hydroxyethyl cellulose (300 ...	13153501	1
Noweda	Hydroxyethyl cellulose (300 ...	13153501	1
Caesar & Loretz GmbH	Hydroxyethyl cellulose (300 ...	13153501	1
Caelo	Hydroxyethyl cellulose (300 ...	13153502	1
Caelo	Hydroxyethyl cellulose (300 ...	13153506	8
AHD	Hydroxyethyl cellulose (300 ...	13153511	1
Fagron	Hydroxyethyl cellulose (300 ...	13A18-N01	5
Gehe	Hydroxyethyl cellulose (300 ...	13A18-N01	1
Phönix	Hydroxyethyl cellulose (300 ...	13378507	1
Caelo	Hydroxyethyl cellulose (300 ...	13D26-N11	2
Fagron	Hydroxyethyl cellulose (300 ...	13D26-N11	6
Fagron	Hydroxyethyl cellulose (9000...	13d26-n16	2
Fagron	Hydroxyethyl cellulose (300 ...	13H22-N11	8
Caelo	Hydroxyethyl cellulose (300 ...	140317	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1406212528	1
Caelo	Hydroxyethyl cellulose (300 ...	26071301	1
Caelo	Hydroxyethyl cellulose (300 ...	26071212	1
Caelo	Hydroxyethyl cellulose (300 ...	4512I-03301	1
Kehr	Hydroxyethyl cellulose (300 ...	211112PML01	1
Caelo	Hydroxyethyl cellulose (300 ...	290114PML01	1
Caelo	Hydroxyethyl cellulose (300 ...	20031305	1
Caelo	Hydroxyethyl cellulose (300 ...	5012I-03301	1
Fagron	Hydroxyethyl cellulose (300 ...	J0696	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hydroxyethyl cellulose (300 ...	AKD10	1
Euro OTC	Hydroxyethyl cellulose (300 ...		2
phönix,30.11.12	Hydroxyethyl cellulose (300 ...	J0696	1
s.Prüfprotokoll	Hydroxyethyl cellulose (300 ...		2
Phönix	Hydroxyethyl cellulose (9000...	1304008-02	1
Caelo	Hydroxyethyl cellulose (300 ...	1504018-02	1
Fagron	Hydroxyethyl cellulose (300 ...	14I04-B05-309049	1
Caelo	Hydroxyethyl cellulose (300 ...	213M-03301	1
Caelo	Hydroxyethyl cellulose (9000...	13182714	1
Caelo	Hydroxyethyl cellulose (300 ...	21011502	1
Caelo	Hydroxyethyl cellulose (300 ...	31031402	1
Gehe	Hydroxyethyl cellulose (300 ...	11266305	1
Kehr	Hydroxyethyl cellulose (300 ...	110024-02	1
Anzag	Hydroxyethyl cellulose (300 ...	12249204	1
Caelo	Hydroxyethyl cellulose (300 ...	12274720	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1613M-03301	1
Caelo	Hydroxyethyl cellulose (300 ...	19011302	1
EuRho	Hydroxyethyl cellulose (300 ...	2512I-03301	1
Caelo	Hydroxyethyl cellulose (300 ...	25071301	1
Euro OTC	Hydroxyethyl cellulose (300 ...	1105054-01	1
Caelo	Hydroxyethyl cellulose (300 ...	313Q-03301	1
Euro OTC	Hydroxyethyl cellulose (300 ...	130902003	1
Euro OTC	Hydroxyethyl cellulose (300 ...	130400802	1

- 55 371 spectra from 335 *Apo-Ident* customers from a total of 20 433 batches from a further 682 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydroxyethylcelluloses (300 / 9000 mPa · s)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroxyethylcelluloses (300 / 9000 mPa · s)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	260	0	75 618
Type B	0	241	49	81 058
Type C	0	596	34	55 371

The substance/substance group *Hydroxyethylcelluloses (300 / 9000 mPa · s)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.6923 %)
Type B	100.0000 % (> 99.9853 %)	83.1034 % (> 82.0690 %)
Type C	100.0000 % (> 99.8622 %)	94.6032 % (> 94.1270 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20791	21792	12.46	79.84
20792	21792	9.81	76.79
20862	22459	7.85	84.24
20908	21365	12.34	74.48
21365	21365	0.00	73.08
21792	21792	0.00	81.69
22459	22459	0.00	83.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hydroxypropyl cellulose (300 mPa · s)**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20686-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hydroxypropyl cellulose (300 mPa · s); Hydroxypropylcellulosum (300 mPa · s)

Special notes

When selecting the *Hydroxypropyl cellulose (300 mPa · s)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hydroxypropyl cellulose (300 mPa · s)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hydroxypropyl ce...	12093107	20686	40	1402049
Caelo	Hydroxypropyl ce...	14189804	21767	40	AR-15-FG-014922-01
Caelo	Hydroxypropyl ce...	15345001	22258	40	20151104

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Hydroxypropyl cellulose* (300 mPa · s). These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Hydroxypropyl cellulose* (300 mPa · s).

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hydroxypropyl cellulose (300...	14189804	21767 [†]	20
Caelo	Hydroxypropyl cellulose (300...	15345001	22258 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Hydroxypropyl cellulose* (300 mPa · s).

Supplier	Substance	Batch	Spectra
Caelo	Hydroxypropyl cellulose (300...	14189801	1
Caelo	Hydroxypropyl cellulose (300...	13031309	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hydroxypropyl cellulose (300 mPa · s)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hydroxypropyl cellulose (300 mPa · s)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	1	1	55 999

The substance/substance group *Hydroxypropyl cellulose (300 mPa · s)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20686	20686	0.00	17.72
21767	21767	0.00	18.21
22258	21767	7.04	21.93

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hyoscine butylbromide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20766-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hyoscine butylbromide; Butylscopolaminium bromatum; Hyoscini butylbromidum

Special notes

When selecting the *Hyoscine butylbromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hyoscine butylbromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Hyoscine butylbr...	12K01-N07	20766	40	1406057
Fagron	Hyoscine butylbr...	12K01-N07	20897	40	20121102
Fagron	Hyoscine butylbr...	13K22-N03	21049	40	20131126
Fagron	Hyoscine butylbr...	15I09-B04_312245	21954	40	20150921
Fagron	Hyoscine butylbr...	15I09-B04-316806	22344	40	20150921

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Hyoscine butylbromide*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 132 spectra of 5 reference samples from the substance/substance group *Hyoscine butylbromide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hyoscine butylbromide	15I09-B04312245	21954 [†]	20
Fagron	Hyoscine butylbromide	15I09-B04-316806	22344 [†]	20
Fagron	Hyoscine butylbromide	16I20-B08-326942	22903	40
Fagron	Hyoscine butylbromide	16I20-B08-326942	22937	40
Fagron	Hyoscine butylbromide	16I20-B08-326942	not required	12

- 81 216 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Hyoscine butylbromide*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hyoscine butylbromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyoscine butylbromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	132	0	81 216
Type C	0	0	0	56 001

The substance/substance group *Hyoscine butylbromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.4545 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20766	20766	0.00	61.12
20897	20766	14.28	60.65
21049	20766	4.38	61.26
21954	20766	4.56	61.23
22344	20766	6.22	60.88

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Hyoscine hydrobromide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21676-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Hyoscine hydrobromide; Scopolamini hydrobromidum

Special notes

When selecting the *Hyoscine hydrobromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Hyoscine hydrobromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Hyoscine hydrobr...	14278801	21676	40	1504154
Caelo	Hyoscine hydrobr...	15054501	21764	40	1511156
Caelo	Hyoscine hydrobr...	15054504	21925	40	20150310
Caelo	Hyoscine hydrobr...	15054501	21764SI	40	1511156
Caelo	Hyoscine hydrobr...	15054504	21925SI	20	20150310

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Hyoscine hydrobromide*. These samples are listed above in the [calibration samples](#) section.
- 75 698 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Hyoscine hydrobromide*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Hyoscine hydrobromide	14278801	21676 [†]	45
Caelo	Hyoscine hydrobromide	15054501	21764 [†]	20
Caelo	Hyoscine hydrobromide	15054504	21925 [†]	20
Caelo	Hyoscine hydrobromide	15054501	21764SI [†]	20
Caelo	Hyoscine hydrobromide	15054504	21925SI [†]	10

- 81 233 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Hyoscine hydrobromide*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Hyoscine hydrobromide	14278801	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Hyoscine hydrobromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Hyoscine hydrobromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	75 698
Type B	0	115	0	81 233
Type C	0	1	0	56 000

The substance/substance group *Hyoscine hydrobromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21676	21676	0.00	57.08
21764	21764	0.00	39.84
21925	21764	18.74	59.98

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ibuprofen**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20205-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ibuprofen; Ibuprofenum

Special notes

When selecting the *Ibuprofen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ibuprofen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ibuprofen	09111410	20205	40	AR-12-FG-002701-01
Caelo	Ibuprofen	11352219	20774	40	20120124
Euro OTC	Ibuprofen	1211011-02	21248	40	1501533

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Ibuprofen*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Ibuprofen*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Ibuprofen	13105108	21321	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ibuprofen*.

Supplier	Substance	Batch	Spectra
Fagron	Ibuprofen	1012039-02	1
Euro OTC	Ibuprofen	1211011-01	1
Rondell Apotheke	Ibuprofen	1410025-01	2

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ibuprofen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ibuprofen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	34	6	81 308
Type C	0	4	0	55 997

The substance/substance group *Ibuprofen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	85.0000 % (> 77.5000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20205	20205	0.00	25.75
20774	21248	8.17	27.08
21248	21248	0.00	26.18

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Indigo carmine I**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20592-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Indigo carmine I

Special notes

When selecting the *Indigo carmine I* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Indigo carmine I*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Indigo carmine I	12C16-N04	20592	40	1509365
Fagron	Indigo carmine I	13K12-N01	21267	40	1601099

Validation samples

A total of 213 227 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 *Indigo carmine I*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *Indigo carmine I*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 batches from the substance/substance group *Indigo carmine I*.

Supplier	Substance	Batch	Spectra
Fagron	Indigo carmine I	13K12-N01	1
Fagron	Indigo carmine I	12K06-N11	1
Fagron	Indigo carmine I	11F09-N06	1
Fagron	Indigo carmine I	12A20-N067-16	1
Fagron	Indigo carmine I	5093143	1
Fagron	Indigo carmine I	5132316	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Indigo carmine I* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Indigo carmine I* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 798
Type B	0	0	0	81 348
Type C	0	3	3	55 995

The substance/substance group *Indigo carmine I* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20592	20592	0.00	84.01
21267	21267	0.00	84.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Indomethacin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20720-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Indomethacin; Indometacinum

Special notes

When selecting the *Indomethacin* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Indomethacin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Indomethacin	1012009-02	20720	40	1402050
Euro OTC	Indomethacin	1205002-01	21327	40	20120521
Euro OTC	Indomethacin	1512031	22291	40	20160122*
Euro OTC	Indomethacin	1612017	22981	40	20170209*

Validation samples

A total of 213 227 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 *Indomethacin*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Indomethacin*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Indomethacin	1512031	22291 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Indomethacin*.

Supplier	Substance	Batch	Spectra
Euro OTC	Indomethacin	1205002-01	2
Euro OTC	Indomethacin	1512031-01	2

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Indomethacin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Indomethacin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 718
Type B	0	20	0	81 328
Type C	0	4	0	55 997

The substance/substance group *Indomethacin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20720	20720	0.00	70.55
21327	22981	3.41	73.45
22291	22291	0.00	71.73
22981	22981	0.00	69.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Inositol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20420-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Inositol; Inositolum; myo-Inositolum

Special notes

When selecting the *Inositol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Inositol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Inositol	1011028-01	20420	40	AR-12-FG-009055-01
Euro OTC	Inositol	1206032-01	21280	40	20120814

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Inositol*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Inositol*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Inositol	L1507021-01	22797	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Inositol*.

Supplier	Substance	Batch	Spectra
Euro OTC	Inositol	1304009-01	3
Euro OTC	Inositol	1407006-01	3
Euro OTC	Inositol	1206032-01	2
Euro OTC	Inositol	130400901	1
Fagron	Inositol	L13090200	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Inositol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Inositol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	10	0	55 991

The substance/substance group *Inositol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20420	20420	0.00	32.60
21280	20420	4.41	31.91

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Iodoform**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20094-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Iodoform; Iodoformium; Jodoformium

Special notes

When selecting the *Iodoform* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Iodoform*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Iodoform	09357608	20094	40	F 2010 000 148
Fagron	Iodoform	12L11-B41	21278	40	20140113
Caelo	Iodoform	12283206	21297	40	20130709

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Iodoform*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *Iodoform*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 140 spectra from 66 *Apo-Ident* customers from 64 batches from the substance/substance group *Iodoform*.

Supplier	Substance	Batch	Spectra
Caelo	Iodoform	12070601	5
Caelo	Iodoform	12283202	4
fragon	Iodoform	12283303	1
Fagron	Iodoform	12E30-N01	2
Caelo	Iodoform	14077601	2
Fagron	Iodoform	12L11-B41	1
Caelo	Iodoform	14077603	3
Caelo	Iodoform	14077702	5
Caelo	Iodoform	14077606	1
Caelo	Iodoform	14230001	2
Caelo	Iodoform	14230002	3
Caelo	Iodoform	14077602	1
Caelo	Iodoform	14230305	2
Caelo	Iodoform	14230007	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Iodoform	14D09-B14-293029	1
Caelo	Iodoform	14230006	2
Caelo	Iodoform	14230008	2
Caelo	Iodoform	15276105	1
Caelo	Iodoform	14230306	5
Caelo	Iodoform	15276102	2
Caelo	Iodoform	16012204	1
Caelo	Iodoform	15276107	1
Caelo	Iodoform	12070102	2
Caelo	Iodoform	3041407	1
Caelo	Iodoform	10120202	1
Anzag ek: 7,28EUR	Iodoform	12070102	1
Noweda	Iodoform	10320402	1
Caelo	Iodoform	12070303	2
Caelo	Iodoform	12070407	1
Noweda	Iodoform	12070407	1
Caelo	Iodoform	12070402	1
Caesar & Loretz GmbH, 4...	Iodoform	12070501	3
Caelo	Iodoform	12070501	1
Caelo	Iodoform	12070502	1
Phoenix	Iodoform	12070601	1
Kehr	Iodoform	12070502	1
Caelo	Iodoform	12070602	3
Caelo	Iodoform	12070605	1
Caelo	Iodoform	12070608	5
Caelo	Iodoform	12070606	1
Caelo	Iodoform	12150902	6
Phönix	Iodoform	12150903	1
Caelo	Iodoform	12150903	2
Caelo	Iodoform	12150905	3
Caelo	Iodoform	12150907	3
Caesar & Loretz GmbH	Iodoform	12150907	1
Phoenix	Iodoform	12150908	1
Caelo	Iodoform	12150908	5
Caelo	Iodoform	12150910	4
Caelo	Iodoform	12283201	3
Caelo	Iodoform	12283206	2
Caelo	Iodoform	12283303	2
Caelo	Iodoform	12283304	2
Caelo	Iodoform	12283307	1
Fagron	Iodoform	12L11-B41-290055	1
Caelo	Iodoform	14229506	1
Euro OTC	Iodoform	14229504	2
Caelo	Iodoform	14077607	1
Caelo	Iodoform	14229508	2
Caelo	Iodoform	14229507	3
Caelo	Iodoform	14230302	1
Caelo	Iodoform	14230308	2
Caelo	Iodoform	15276101	3
Caelo	Iodoform	15276002	1
Caelo	Iodoform	15276109	1
Caelo	Iodoform	15276001	1
Caelo	Iodoform	16012201	1
Caelo	Iodoform	15276111	1
Caelo	Iodoform	2013E-01726	1
Caelo	Iodoform	21051305	1
Caelo	Iodoform	28011503	1
Kehr	Iodoform	2070602	1
Caelo	Iodoform	12283201/311152	1

- 55 861 spectra from 335 *Apo-Ident* customers from a total of 20 547 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Iodoform* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Iodoform* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	0	0	81 348
Type C	0	124	16	55 861

The substance/substance group *Iodoform* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8622 %)	88.5714 % (> 86.4286 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20094	20094	0.00	80.05
21278	20094	21.27	85.32
21297	20094	21.58	87.12

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ipratropium bromide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20911-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ipratropium bromide; Ipratropii bromidum; Ipratropium bromatum

Special notes

When selecting the *Ipratropium bromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ipratropium bromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ipratropium brom...	12C15-N01	20911	40	1403675
Fagron	Ipratropium brom...	12K01-N08	21272	40	20121025

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Ipratropium bromide*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Ipratropium bromide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ipratropium bromide	15C04-B02-321674	22747	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ipratropium bromide*.

Supplier	Substance	Batch	Spectra
Fagron	Ipratropium bromide	14B05-B16-294566	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ipratropium bromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ipratropium bromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	1	0	56 000

The substance/substance group *Ipratropium bromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20911	20911	0.00	42.18
21272	20911	8.25	40.91

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Isosorbide dinitrate 40%**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20213-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Isosorbide dinitrate 40%; Isorbidi dinitras 40%; Isosobidum dinatricum 40%

Special notes

When selecting the *Isosorbide dinitrate 40%* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Isosorbide dinitrate 40%*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Isosorbide dinit...	10L09-N10	20213	40	AR-12-FG-003632-01
Fagron	Isosorbide dinit...	12F08-N04	20891	40	20120801
Fagron	Isosorbide dinit...	13D15-N02	21347	39	20130410

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 119 spectra of 3 reference samples from the substance/substance group *Isosorbide dinitrate 40%*. These samples are listed above in the [calibration samples](#) section.
- 75 759 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Isosorbide dinitrate 40%*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Isosorbide dinitrate 40%	15I10-B01-315217	22762	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 162 spectra from 83 *Apo-Ident* customers from 61 batches from the substance/substance group *Isosorbide dinitrate 40%*.

Supplier	Substance	Batch	Spectra
Fagron	Isosorbide dinitrate 40%	14D09-B03	5
Caelo	Isosorbide dinitrate 40%	14D09-B03-294281	2
Fagron	Isosorbide dinitrate 40%	14D09-B03-300234	11
Fagron	Isosorbide dinitrate 40%	14D09-B03-307018	1
Fagron	Isosorbide dinitrate 40%		2
Gehe	Isosorbide dinitrate 40%	11D12-N01	1
Fagron	Isosorbide dinitrate 40%	12C08-N05	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Isosorbide dinitrate 40%	11D12-N01	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294280	5
Fagron	Isosorbide dinitrate 40%	12f08-n04	1
Fagron	Isosorbide dinitrate 40%	13F27-N04	8
Fagron	Isosorbide dinitrate 40%	13D15-N02	9
Fagron	Isosorbide dinitrate 40%	14D09-B03-29481	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294282	3
Fagron	Isosorbide dinitrate 40%	8564340	1
Fagron	Isosorbide dinitrate 40%	101652	1
Fagron	Isosorbide dinitrate 40%	12F08-N04	10
Caelo	Isosorbide dinitrate 40%	11/17-N05	1
Fagron	Isosorbide dinitrate 40%	11D12-N01	4
Fagron	Isosorbide dinitrate 40%	11J17-No5	1
Fagron	Isosorbide dinitrate 40%	12k14-n02	1
Caelo	Isosorbide dinitrate 40%	13F27-N04	1
Fagron	Isosorbide dinitrate 40%	13I26-N18	8
Sanacorp	Isosorbide dinitrate 40%	14D09-B03-294280	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294281	3
Fagron	Isosorbide dinitrate 40%	149168	1
ebe a	Isosorbide dinitrate 40%	14D09-B03-294281	1
Allianz Healthcare 17.0...	Isosorbide dinitrate 40%	14D09-B03-300234	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-294282Eber	1
Caelo	Isosorbide dinitrate 40%	14D-09-B03-300234	1
Caelo	Isosorbide dinitrate 40%	14D09-B03-307018	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-308419	8
Caelo	Isosorbide dinitrate 40%	14D09-B03-308419	1
Wepa	Isosorbide dinitrate 40%	14D09-B03-313566	1
Fagron	Isosorbide dinitrate 40%	14D09-B3-308419	1
Fagron	Isosorbide dinitrate 40%	14D09-B03-313566	1
Fagron	Isosorbide dinitrate 40%	15/10-B01-315217	2
Fagron	Isosorbide dinitrate 40%	3115M-03516	1
Fagron	Isosorbide dinitrate 40%	testxx	1
Fagron	Isosorbide dinitrate 40%	15/10-B01-320081	1
Fagron	Isosorbide dinitrate 40%	3211U-03516	1
Fagron	Isosorbide dinitrate 40%	9101205	1
Fagron	Isosorbide dinitrate 40%	X12010	1
Noweda	Isosorbide dinitrate 40%	15/10-B01-315217	1
Fagron	Isosorbide dinitrate 40%	4314U-03516	1
Fagron	Isosorbide dinitrate 40%	2114M3516	1
Fagron	Isosorbide dinitrate 40%	10029-N10	1
Fagron	Isosorbide dinitrate 40%	9E05-N05	2
Noweda	Isosorbide dinitrate 40%	10G15-N01	1
Fagron	Isosorbide dinitrate 40%	11/17-N05	1
Fagron	Isosorbide dinitrate 40%	10D29-N10	1
Fagron	Isosorbide dinitrate 40%	11/17-No5	1
FARGON	Isosorbide dinitrate 40%	11f20-n05	1
Anzag 11.04.12	Isosorbide dinitrate 40%	11F28-N05	1
Phönix 22.11.2012	Isosorbide dinitrate 40%	11F28-N05	1
Sanacorp	Isosorbide dinitrate 40%	11J17-N05	1
Fagron	Isosorbide dinitrate 40%	11I17-N05	1
Fagron	Isosorbide dinitrate 40%	11J17-N05	1
Fagron	Isosorbide dinitrate 40%	11I17-N05	1
Fiebig 23.05.13 ek: 10,...	Isosorbide dinitrate 40%	12F08-N04	1
Fagron	Isosorbide dinitrate 40%	12K14-N02	7
Fagron	Isosorbide dinitrate 40%	12F08N04	1
Fagron	Isosorbide dinitrate 40%	13A07-0003	1
Fagron	Isosorbide dinitrate 40%	13A07-N13	5
Fagron	Isosorbide dinitrate 40%	1309210009	1
Fagron	Isosorbide dinitrate 40%	12K14N02	1
Phönix, 25.09.2013	Isosorbide dinitrate 40%	12K14-N02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Isosorbide dinitrate 40%	13d15-n02	1
Caelo	Isosorbide dinitrate 40%	13D15-N02	3
Phönix	Isosorbide dinitrate 40%	13A07-N13	1
Fagron	Isosorbide dinitrate 40%	2413Q03516	1
Fagron	Isosorbide dinitrate 40%	13D15-No2	1
Fagron	Isosorbide dinitrate 40%	3413U03516	1
Fagron	Isosorbide dinitrate 40%	P11008	2
Fagron	Isosorbide dinitrate 40%	2405210009	1
Fagron	Isosorbide dinitrate 40%	26061207	1
Fagron	Isosorbide dinitrate 40%	391311-03516	1
Euro OTC	Isosorbide dinitrate 40%		1

- 55 839 spectra from 335 *Apo-Ident* customers from a total of 20 550 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Isosorbide dinitrate 40%* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Isosorbide dinitrate 40%* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	119	0	75 759
Type B	0	40	0	81 308
Type C	0	151	11	55 839

The substance/substance group *Isosorbide dinitrate 40%* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.9580 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	93.2099 % (> 91.3580 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20213	20213	0.00	49.00
20891	20213	16.22	49.96
21347	20213	9.87	49.72

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Isoxuprine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22640-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Isoxuprine hydrochloride; Isoxsuprini hydrochloridum

Special notes

When selecting the *Isoxuprine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Isoxuprine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Isoxuprine hydro...	161770	22640	40	20160818*
Euro OTC	Isoxuprine hydro...	1503008-01	22659	40	20150430

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Isoxuprine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Isoxuprine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Isoxuprine hydrochloride	16177001	22735	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Isoxuprine hydrochloride*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Validation results

The validation runs checked whether the substance/substance group *Isoxuprine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Isoxuprine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Isoxuprine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22640	22640	0.00	43.26
22659	22640	8.87	43.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ketamine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20278-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ketamine hydrochloride; Ketamini hydrochloridum; Ketaminum hydrochloricum

Special notes

When selecting the *Ketamine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ketamine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ketamine hydroch...	13H19-N01	21044	40	8931
Fagron	Ketamine hydroch...	14I03-B02-303165	21779	40	20140926
Fagron	Ketamine hydroch...	14I03-B02-311706	22533	40	20140926

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Ketamine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Ketamine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ketamine hydrochloride	11A27-N13	20278	40
Fagron	Ketamine hydrochloride	14I03-B02-303165	21779 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 batches from the substance/substance group *Ketamine hydrochloride*.

Supplier	Substance	Batch	Spectra
GEHE 27.05.2014	Ketamine hydrochloride	13H19-N01	1
Noweda	Ketamine hydrochloride	292414P	1
Fagron	Ketamine hydrochloride	15E07-B03-322164	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
Fagron	Ketamine hydrochloride	14/03-B02-303165	1
Noweda	Ketamine hydrochloride	14/03-B02-311706	1
Fagron	Ketamine hydrochloride	12F01-N11	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ketamine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ketamine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	46	14	81 288
Type C	0	4	2	55 995

The substance/substance group *Ketamine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	76.6667 % (> 71.6667 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21044	21044	0.00	55.62
21779	21044	5.04	55.71
22533	21044	16.33	56.86

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ketoconazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20688-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ketoconazole; Ketoconazolum

Special notes

When selecting the *Ketoconazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ketoconazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Ketoconazole	12171007	20688	40	1401554
Fagron	Ketoconazole	12A16-N06	20699	40	20120123
Caelo	Ketoconazole	13179612	21514	40	20130613
Caelo	Ketoconazole	13179612	21515	40	20130613

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Ketoconazole*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Ketoconazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ketoconazole	10J18-N07	20275	40
Caelo	Ketoconazole	13179612	21514 [†]	20
Caelo	Ketoconazole	13179612	21515 [†]	20

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 49 spectra from 29 *Apo-Ident* customers from 26 batches from the substance/substance group *Ketoconazole*.

Supplier	Substance	Batch	Spectra
Caelo	Ketoconazole	13179610	4
Caelo	Ketoconazole	13179606	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
Caelo	Ketoconazole	12300407	4
Caelo	Ketoconazole	12300415	1
Fagron	Ketoconazole	13179612	1
Caelo	Ketoconazole	13179612	1
Caelo	Ketoconazole	13399404	7
Caelo	Ketoconazole	13399408	4
ANZAG 23.07.14	Ketoconazole	13h09-n07	1
Fagron	Ketoconazole	13J23-N04	1
Fagron	Ketoconazole	13H09-N07	1
Fagron	Ketoconazole	14K04-B06-309671	1
Fagron	Ketoconazole	14E09-B01-293736	1
Caelo	Ketoconazole	14350408	1
Fagron	Ketoconazole	15G23-B03-312063	1
Caelo	Ketoconazole	53317046	2
Caelo	Ketoconazole	11070001	1
Caelo	Ketoconazole	11070022	2
Gehe	Ketoconazole	11070019	1
anzag, 14.11.2012	Ketoconazole	12171008	1
Phönix	Ketoconazole	12171018	1
Caelo	Ketoconazole	13179601	1
Caelo	Ketoconazole	12171007	1
Caelo	Ketoconazole	12171008	1
Phönix	Ketoconazole	13179602	3
Caelo	Ketoconazole	12300406	1
Fagron	Ketoconazole	12I17-N02	1
Fagron	Ketoconazole	12I17-N02	1

- 55 952 spectra from 335 *Apo-Ident* customers from a total of 20 585 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ketoconazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ketoconazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	70	10	81 268
Type C	0	49	0	55 952

The substance/substance group *Ketoconazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	87.5000 % (> 83.7500 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 87.7551 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20688	20688	0.00	75.13
20699	20688	8.39	74.57
21514	20688	4.14	75.08
21515	20688	4.87	73.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ketoprofen**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21813-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ketoprofen; Ketoprofenum

Special notes

When selecting the *Ketoprofen* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ketoprofen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Inresa	Ketoprofen	F1300183	21813	40	AR-15-FG-009572-01
Inresa	Ketoprofen	F1300182	22310	40	20150617

Validation samples

A total of 213 227 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 *Ketoprofen*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Ketoprofen*.

Supplier	Substance	Batch	Sample ID	Spectra
Inresa	Ketoprofen	F1300183	21813 [†]	20
Inresa	Ketoprofen	F1300182	22310 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ketoprofen*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Ketoprofen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ketoprofen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Ketoprofen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21813	21813	0.00	43.01
22310	21813	2.10	42.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Lactose monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20029-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lactose monohydrate; Lactosum monohydricum; Saccharum lactis

Special notes

When selecting the *Lactose monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lactose monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Lactose monohydr...	83278189	20029	30	I 2009 000 290
Caelo	Lactose monohydr...	12139910	20685	40	20120606
Caelo	Lactose monohydr...	14025601	21525	40	20140207
Caelo	Lactose monohydr...	14025601	21526	40	20140207
Caelo	Lactose monohydr...	14025601	21529	40	20140207
Euro OTC	Lactose monohydr...	1509030	21935	40	20151013*
Caelo	Lactose monohydr...	160277	22460	40	20160321*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Lactose monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Lactose monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Lactose monohydrate	14025601	21527	40
Caelo	Lactose monohydrate	14025601	21528	40
Euro OTC	Lactose monohydrate	1509030	21935 [†]	20
Caelo	Lactose monohydrate	160277	22460 [†]	20
Caelo	Lactose monohydrate	15236220	22584	40
Euro OTC	Lactose monohydrate	1606025	22701	40

- 81 148 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 589 spectra from 143 *Apo-Ident* customers from 236 batches from the substance/substance group *Lactose monohydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Lactose monohydrate	3031501	1
Caelo	Lactose monohydrate	3091405	1
Eigenherstellung	Lactose monohydrate	40815HMS01	1
Caelo	Lactose monohydrate	3121406	1
Caelo	Lactose monohydrate	5061504	1
Eigenherstellung	Lactose monohydrate	60814HSA01	1
Caelo	Lactose monohydrate	7031402	1
Caelo	Lactose monohydrate	7111402	1
Caelo	Lactose monohydrate	8071501	1
Caelo	Lactose monohydrate	10195107	3
Caelo	Lactose monohydrate	9051401	1
Anzag/Fragon	Lactose monohydrate	1005SLP	1
Fagron	Lactose monohydrate	10751120	1
Caelo	Lactose monohydrate	12041401	1
Caelo	Lactose monohydrate	12399107	1
Euro OTC	Lactose monohydrate	1301028-01	6
Phönix/Euro	Lactose monohydrate	1301028-02	2
Euro OTC	Lactose monohydrate	1301028-02	14
Gehe	Lactose monohydrate	1301028-02	1
Caelo	Lactose monohydrate	13104901	6
Caelo	Lactose monohydrate	13104909	4
Phoenix 19.03.2014	Lactose monohydrate	13104909	1
Caelo	Lactose monohydrate	13104911	3
Caelo	Lactose monohydrate	13299102	13
Caelo	Lactose monohydrate	13299101	11
Caelo	Lactose monohydrate	13299106	2
Caelo	Lactose monohydrate	13299103	2
Gehe	Lactose monohydrate	13299107	3
Caelo	Lactose monohydrate	13299108	5
Caelo	Lactose monohydrate	13299107	3
Sanacorp	Lactose monohydrate	13299108	1
GEHE am 17.06.2014	Lactose monohydrate	13299108	1
Fagron	Lactose monohydrate	13I23-B03	4
AHD	Lactose monohydrate	13I23-B03-291114	1
Fagron	Lactose monohydrate	13I23-B03-291116	1
Fagron	Lactose monohydrate	13I23-B03-291115	1
Fagron	Lactose monohydrate	13I23-B03-287414	1
Caelo	Lactose monohydrate	13299112	1
Fagron	Lactose monohydrate	13J23-B03-291114	1
Euro OTC	Lactose monohydrate	1401003-01	12
gehe	Lactose monohydrate	1401003-01	2
Caelo	Lactose monohydrate	1401003-01	1
EuRho/Phönix	Lactose monohydrate	1401003-01	2
Euro OTC	Lactose monohydrate	1401003-02	4
Euroo/Phoenix	Lactose monohydrate	1401003-02	1
Euro/Phönix	Lactose monohydrate	1401003-02	1
Bahnhof-Apotheke	Lactose monohydrate	140220	1
Caelo	Lactose monohydrate	1402504	1
Noweda	Lactose monohydrate	14025601	1
Caelo	Lactose monohydrate	14025601	3
Caelo	Lactose monohydrate	14025603	7
Caelo	Lactose monohydrate	14025604	7
Caelo	Lactose monohydrate	14025608	1
Caelo	Lactose monohydrate	14025611	1
Caelo	Lactose monohydrate	14025615	1
Caelo	Lactose monohydrate	14025616	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Lactose monohydrate	14025616	1
Caelo	Lactose monohydrate	14025619	4
Schubert / Phoenix	Lactose monohydrate	1404PLV-1928	4
Caelo	Lactose monohydrate	14025620	5
Caelo	Lactose monohydrate	14140302	3
Sanacorp	Lactose monohydrate	14025620	1
Caelo	Lactose monohydrate	14140304	4
Caelo	Lactose monohydrate	14140305	7
Gehe	Lactose monohydrate	14140306	1
Caelo	Lactose monohydrate	14140306	2
Caelo	Lactose monohydrate	14140308	5
Caelo	Lactose monohydrate	14140309	2
Caelo	Lactose monohydrate	14140312	8
Caelo	Lactose monohydrate	14333501	3
Caelo	Lactose monohydrate	14333509	6
Caelo	Lactose monohydrate	14333502	1
Caelo	Lactose monohydrate	14333503	1
Caelo	Lactose monohydrate	14333508	1
Sanacorp	Lactose monohydrate	14333509	1
Caelo	Lactose monohydrate	14333511	3
Caelo	Lactose monohydrate	14333510	1
Caelo	Lactose monohydrate	143335114	1
Sanacorp	Lactose monohydrate	14333518	1
Caelo	Lactose monohydrate	14333513	1
Caelo	Lactose monohydrate	14333518	3
Fagron	Lactose monohydrate	14333518	1
Caelo	Lactose monohydrate	14333520	7
Caelo	Lactose monohydrate	14333521	4
Caelo	Lactose monohydrate	1433520	1
Fagron	Lactose monohydrate	14333525	1
Caelo	Lactose monohydrate	1433510	1
Fagron	Lactose monohydrate	14A30-B07	2
Fagron	Lactose monohydrate	14H27-B02	1
Fagron	Lactose monohydrate	14H27-B01-305666	1
Caelo	Lactose monohydrate	1501017-01	2
Euro OTC	Lactose monohydrate	1501017-01	8
Euro OTC	Lactose monohydrate	1509030-01	2
Rondell Apotheke	Lactose monohydrate	1509030-01	2
Euro OTC	Lactose monohydrate	1501017-02	1
Euro OTC	Lactose monohydrate	150101701	1
Caelo	Lactose monohydrate	15011701	1
Euro OTC	Lactose monohydrate	15090-30-02	1
Caelo	Lactose monohydrate	15236201	6
Caelo	Lactose monohydrate	15236204	4
Caelo	Lactose monohydrate	15236202	1
Caesar & Loretz/Noweda	Lactose monohydrate	15236204	1
Caelo	Lactose monohydrate	15236206	1
Caelo	Lactose monohydrate	15236208	3
Caelo	Lactose monohydrate	15236209	2
Caelo	Lactose monohydrate	15236214	5
Caelo	Lactose monohydrate	15236215	2
Caelo	Lactose monohydrate	15236220	2
Ebert u. Jacobi 18.0...	Lactose monohydrate	15236215	1
Caelo	Lactose monohydrate	15236221	2
Gehe	Lactose monohydrate	15A19-B06	3
Caelo	Lactose monohydrate	1526201	1
Fagron	Lactose monohydrate	15A19-B06	2
Fagron	Lactose monohydrate	15A19-B06-303437	2
Fagron	Lactose monohydrate	15H14-B03-314451	3
Caelo	Lactose monohydrate	16027704	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lactose monohydrate	16027701	1
Caelo	Lactose monohydrate	23061504	1
Caelo	Lactose monohydrate	23101404	1
Caelo	Lactose monohydrate	200415HJK02	1
Caelo	Lactose monohydrate	16027708	2
Caelo	Lactose monohydrate	23051501	1
Caelo	Lactose monohydrate	26071401	1
Bombastus	Lactose monohydrate	291464	1
Bombastus	Lactose monohydrate	293918/0	1
Bombastus	Lactose monohydrate	294184/0	1
Bombastus	Lactose monohydrate	294897/0	1
Bombastus	Lactose monohydrate	295011/0	1
Caelo	Lactose monohydrate	1071302	1
Gatt-Koller	Lactose monohydrate	5580/12120813	2
Caelo	Lactose monohydrate	30031503	1
Euro OTC	Lactose monohydrate	3215A-02210	1
Eigenherstellung	Lactose monohydrate	30912HML01	1
Eigenherstellung	Lactose monohydrate	40113HJK01	1
Caelo	Lactose monohydrate	6091301	1
Eigenherstellung	Lactose monohydrate	70113HML01	1
Alliance Healthcare	Lactose monohydrate	10195101	1
Caelo	Lactose monohydrate	11014714	1
Europharm/Otto	Lactose monohydrate	1106022-01	1
Caelo	Lactose monohydrate	8021401	1
Gehe	Lactose monohydrate	1106022-02	2
Noweda	Lactose monohydrate	1106022-02	1
Caelo	Lactose monohydrate	11079002	2
EuRho	Lactose monohydrate	1112020-01	1
Euro OTC	Lactose monohydrate	110602202	1
Euro OTC	Lactose monohydrate	1112020-01	3
vdl	Lactose monohydrate	1112020-01	2
Eigenherstellung	Lactose monohydrate	110913HJK01	1
Gehe	Lactose monohydrate	1112020-01	2
Gehe	Lactose monohydrate	1112020-02	7
Euro OTC	Lactose monohydrate	1112020-02	4
Gehe	Lactose monohydrate	11120220-01	1
Caelo	Lactose monohydrate	11219208	3
Caelo	Lactose monohydrate	11219216	4
Fagron	Lactose monohydrate	11C29-N06	1
Caelo	Lactose monohydrate	12021502	2
Fagron	Lactose monohydrate	12/23-B02-287554	1
Fagron	Lactose monohydrate	11L22-N03	1
Caelo	Lactose monohydrate	12021507	3
Caelo	Lactose monohydrate	12021518	11
GEHE	Lactose monohydrate	12021508	1
Caelo	Lactose monohydrate	12021508	2
Bahnhof-Apotheke	Lactose monohydrate	120614	1
Bahnhof-Apotheke	Lactose monohydrate	120808	1
Bahnhof-Apotheke	Lactose monohydrate	121119	2
Bahnhof-Apotheke Kempten	Lactose monohydrate	120808	1
Caelo	Lactose monohydrate	12139901	4
Caelo	Lactose monohydrate	12139909	1
Caelo	Lactose monohydrate	12139910	3
Anzag 29.11.12 ek:7,51	Lactose monohydrate	12139914	1
Caelo	Lactose monohydrate	12139914	6
Herbasinica	Lactose monohydrate	12139910	1
Caelo	Lactose monohydrate	12139915	4
Anzag	Lactose monohydrate	12139915	5
Caelo	Lactose monohydrate	12139920	6
Caelo	Lactose monohydrate	12336801	6

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lactose monohydrate	12336803	1
Caelo	Lactose monohydrate	12336804	1
Caelo	Lactose monohydrate	12336814	1
Caelo	Lactose monohydrate	12336815	10
Noweda/ Caesar&Loretz	Lactose monohydrate	12336815	1
Anzag 11.06.2013	Lactose monohydrate	12336815	1
Sanacorp	Lactose monohydrate	12336815	1
Phönix	Lactose monohydrate	12336815	1
cesar&lorenz/Phönix	Lactose monohydrate	12336815	1
Caelo	Lactose monohydrate	12336816	5
Fagron	Lactose monohydrate	12C09-N04	1
Caelo	Lactose monohydrate	12336820	4
Fagron	Lactose monohydrate	12C26-N05	1
Caelo	Lactose monohydrate	12336821	1
Fagron	Lactose monohydrate	12G27-N02	5
Fagron	Lactose monohydrate	13/23-B02-287554	1
Euro OTC	Lactose monohydrate	130102801	1
EuRho	Lactose monohydrate	1301028-01	1
Sanacorp	Lactose monohydrate	1301028-01	1
Caelo	Lactose monohydrate	1301C005	2
Bahnhof-Apotheke	Lactose monohydrate	130115	1
Fagron	Lactose monohydrate	1301C005-278129	2
Fagron	Lactose monohydrate	1301C006-278128	4
Caelo	Lactose monohydrate	1301C006-278128	1
Fagron	Lactose monohydrate	1301C007-278131	1
Fagron	Lactose monohydrate	1301C008-278130	1
Fagron	Lactose monohydrate	1303C002-280398	1
Fagron	Lactose monohydrate	1303C001-280388	1
Fagron	Lactose monohydrate	1303C001	1
Fagron	Lactose monohydrate	1303C003	1
Bahnhof-Apotheke	Lactose monohydrate	130729	1
Caelo	Lactose monohydrate	13081302	1
Fagron	Lactose monohydrate	1303C003-280390	1
Bahnhof-Apotheke	Lactose monohydrate	130911	1
Fagron	Lactose monohydrate	13088R	1
Fagron	Lactose monohydrate	13096R	1
Bahnhof-Apotheke	Lactose monohydrate	130925	1
Cealo	Lactose monohydrate	13104901	1
gehe 12.09.13	Lactose monohydrate	13104901	1
Caelo	Lactose monohydrate	13104902	8
Caelo	Lactose monohydrate	13104908	3
Caelo	Lactose monohydrate	13104910	2
Phönix	Lactose monohydrate	13299102	2
Sanacorp	Lactose monohydrate	13299102	1
Fagron	Lactose monohydrate	13E23-B01	2
Euro OTC	Lactose monohydrate	140-1003-01	1
Fagron	Lactose monohydrate	13E23-B01-283332	1
schubert / Phoenix	Lactose monohydrate	1334PLV-1775	1
Fagron	Lactose monohydrate	13E23-B01-283334	2
Bahnhof-Apotheke	Lactose monohydrate	140113	1
Caelo	Lactose monohydrate	160913PJK01	1
Caelo	Lactose monohydrate	17011302	1
Bombastus	Lactose monohydrate	274926	1
Caelo	Lactose monohydrate	20021411	1
Caelo	Lactose monohydrate	24011405	1
Bombastus	Lactose monohydrate	272680/0	1
Caelo	Lactose monohydrate	25011303	1
Caelo	Lactose monohydrate	17011301	1
Bombastus	Lactose monohydrate	275194/0	1
Bombastus	Lactose monohydrate	282648	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Lactose monohydrate	282567/0	1
Bombastus	Lactose monohydrate	283992	2
Bombastus	Lactose monohydrate	285087/0	1
Bombastus	Lactose monohydrate	286697/0	1
Bombastus	Lactose monohydrate	284321/0	1
Bombastus	Lactose monohydrate	282696/0	1
Bombastus	Lactose monohydrate	275225/0	1
Bombastus	Lactose monohydrate	288927	1
Bombastus	Lactose monohydrate	288015/0	1
Bombastus	Lactose monohydrate	289238	1
Caelo	Lactose monohydrate	30101201	1
Caelo	Lactose monohydrate	31081301	1
Caelo	Lactose monohydrate	2901312210	1
Caelo	Lactose monohydrate	3788916	1
Caelo	Lactose monohydrate	4313Q2210	1
Euro OTC	Lactose monohydrate	L1237A4172	1
Caelo	Lactose monohydrate	6859858	1
Spangropharm	Lactose monohydrate	91444379	1
Bahnhof-Apotheke	Lactose monohydrate	140310	2
Caelo	Lactose monohydrate	s-100513-1	1
Bahnhof-Apotheke	Lactose monohydrate	140206	2
Bahnhof-Apotheke	Lactose monohydrate	140612	3
Caelo/Noweda	Lactose monohydrate	1523204	1
Fagron	Lactose monohydrate	11H04-N04	1
Noweda	Lactose monohydrate	1112020-01	1
Caelo	Lactose monohydrate	11219217	1
Caelo	Lactose monohydrate	120403	1
Caelo	Lactose monohydrate	12139908	2
Bahnhof-Apotheke	Lactose monohydrate	131112	1
Bahnhof-Apotheke	Lactose monohydrate	131218	2
Bahnhof-Apotheke	Lactose monohydrate	131127	2
Gutenberg-Apotheke	Lactose monohydrate	140113	2
Fagron	Lactose monohydrate	1301C006	1
Caelo	Lactose monohydrate	12139912	2
Fagron	Lactose monohydrate	10726158	1
Euro OTC	Lactose monohydrate	1013Q-02210	1
Fagron	Lactose monohydrate	14A30-B07-296182	2
Nachprüfung	Lactose monohydrate	3712Q-02210	1
Anzag / Noweda	Lactose monohydrate	12336815	1
Caelo	Lactose monohydrate		1
Peter Kölln	Lactose monohydrate	229719241-0640	1
Bahnhofsapotheke	Lactose monohydrate	140401	1
Bahnhof-Apotheke	Lactose monohydrate	140630	1
Fagron	Lactose monohydrate	10706040	1
	Lactose monohydrate	12021518	1
A.H.D.	Lactose monohydrate	12336801	1
Bahnhof-Apotheke	Lactose monohydrate	131023	1
Sanacorp	Lactose monohydrate	13104901	1
Sanacorp	Lactose monohydrate	13104909	1
Caelo	Lactose monohydrate	13104909-3422310182	1
Caelo	Lactose monohydrate	13104909-3453311172	1
Caelo	Lactose monohydrate	13104912	1

- 55 412 spectra from 335 *Apo-Ident* customers from a total of 20 381 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lactose monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lactose monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	200	0	81 148
Type C	0	586	3	55 412

The substance/substance group *Lactose monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8622 %)	99.4907 % (> 98.9813 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20029	20029	0.00	60.31
20685	21935	3.65	61.26
21525	21935	3.50	54.98
21526	21935	3.77	53.75
21529	21935	3.32	55.77
21935	21935	0.00	58.22
22460	22460	0.00	60.36

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Levocarnitine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20357-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Levocarnitine; Levocarnitivum

Special notes

When selecting the *Levocarnitine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Levocarnitine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Levocarnitine	1106012-02	20357	40	AR-12-FG-009574-01
Euro OTC	Levocarnitine	1210029-01	20809	40	20121130
Fagron	Levocarnitine	12H10-N07	20818	40	20120830
Fagron	Levocarnitine	14A20-B11-290728	21790	40	AR-15-FG-016322-01
Fagron	Levocarnitine	14A20-B11-290728	21968	40	AR-16-FG-005969-01

Validation samples

A total of 213 227 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 *Levocarnitine*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Levocarnitine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Levocarnitine	11E18-N06	20285	45
Euro OTC	Levocarnitine	1303027-02	21648	60
Fagron	Levocarnitine	14A20-B11-290728	21790 [†]	20
Fagron	Levocarnitine	14A20-B11-290728	21968 [†]	20

- 81 203 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 batches from the substance/substance group *Levocarnitine*.

Supplier	Substance	Batch	Spectra
Fagron	Levocarnitine	13G19-N12	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
Fagron	Levocarnitine	9041504	1
Euro OTC	Levocarnitine	7120	1
Fagron	Levocarnitine	130526	1
Fagron	Levocarnitine	150104	1
Euro OTC	Levocarnitine	1303027-01	1
Euro OTC	Levocarnitine	1303027	1
Euro OTC	Levocarnitine	1106012-020	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Levocarnitine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Levocarnitine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	45	81 203
Type C	0	10	0	55 991

The substance/substance group *Levocarnitine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	68.9655 % (> 66.8966 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20357	20357	0.00	34.26
20809	20357	12.86	32.71
20818	20357	7.80	34.37
21790	21790	0.00	32.70
21968	21968	0.00	35.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Levothyroxine sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21708-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Levothyroxine sodium; Levothyroxinum natrii

Special notes

When selecting the *Levothyroxine sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Levothyroxine sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Levothyroxine so...	14E28-B05-298322	21708	20	1506426
Fagron	Levothyroxine so...	14E28-B05-306102	21820	40	20140915
Fagron	Levothyroxine so...	14E28-B05-298322	21708SI	32	1506426
Fagron	Levothyroxine so...	14E28-B05-306102	21820SI	38	20140915

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 130 spectra of 4 reference samples from the substance/substance group *Levothyroxine sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 748 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 77 spectra of 5 reference samples from the substance/substance group *Levothyroxine sodium*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Levothyroxine sodium	14E28-B05-298322	21708 [†]	10
Fagron	Levothyroxine sodium	14E28-B05-306102	21820 [†]	20
Fagron	Levothyroxine sodium	16G25-B99-324827	not required	17
Fagron	Levothyroxine sodium	14E28-B05-298322	21708SI [†]	15
Fagron	Levothyroxine sodium	14E28-B05-306102	21820SI [†]	15

- 81 271 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Levothyroxine sodium*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Levothyroxine sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Levothyroxine sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	124	6	75 748
Type B	0	69	8	81 271
Type C	0	0	0	56 001

The substance/substance group *Levothyroxine sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.3846 % (> 93.0769 %)
Type B	100.0000 % (> 99.9853 %)	89.6104 % (> 85.7143 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21708	21708	0.00	66.26
21820	21708	19.65	73.64

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-glutathione**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20366-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-glutathione; L-Glutathionum

Special notes

When selecting the *L-glutathione* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-glutathione*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Dr. Behr	L-glutathione	WE-11020045	20366	40	AR-12-FG-007114-01
Euro OTC	L-glutathione	1102019-02	21788	40	AR-15-FG-008218-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group L-glutathione. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 L-glutathione.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	L-glutathione	1102019-02	21788 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 3 *Apo-Ident* customers from 8 batches from the substance/substance group L-glutathione.

Supplier	Substance	Batch	Spectra
Euro OTC	L-glutathione	1102019-01	1
Fagron	L-glutathione	14H21-B02	1
Dr. Behr GmbH	L-glutathione	WE14110006	1
Fagron	L-glutathione	11E02-N08	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
dr.behr	L-glutathione	PF12E80201	2
dr.behr	L-glutathione	WE11020045	1
dr.behr	L-glutathione	WE-12070001	1
Dr. Behr GmbH	L-glutathione	WE14010014	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-glutathione* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-glutathione* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	9	0	55 992

The substance/substance group *L-glutathione* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20366	20366	0.00	43.25
21788	21788	0.00	40.61

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Lidocaine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20942-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lidocaine; Lidocainum

Special notes

When selecting the *Lidocaine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lidocaine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Lidocaine	13H05-N05	20942	40	1401378
Euro OTC	Lidocaine	1310023-01	21640	40	20131118
Caelo	Lidocaine	13352411	21673	40	20131115
Euro OTC	Lidocaine	1612021	22984	40	20170206*

Validation samples

A total of 213 227 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 *Lidocaine*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Lidocaine*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Lidocaine	pending	20148	40
Euro OTC	Lidocaine	1310023-01	21640 [†]	20
Caelo	Lidocaine	13352411	21673 [†]	20
Euro OTC	Lidocaine	1603027	22526	40
Caelo	Lidocaine	162895	22768	40

- 81 188 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 223 spectra from 105 *Apo-Ident* customers from 93 batches from the substance/substance group *Lidocaine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Lidocaine	5111201	1
Fagron	Lidocaine	214U-03584	1
Phönix 29.03.2012	Lidocaine	9205906	1
Fagron	Lidocaine	6J23-No2	1
Caelo	Lidocaine	9205919	1
Fagron	Lidocaine	515M-07006	1
Caelo	Lidocaine	9205922	1
Fagron	Lidocaine	1113M-03584	1
Fagron	Lidocaine	11C09-N07	2
Fagron	Lidocaine	1116E-07006	1
Fagron	Lidocaine	12/21-N06	2
Fagron	Lidocaine	11K17-N03	2
Fagron	Lidocaine	11D28-N12	1
Euro OTC	Lidocaine	12163801	5
Phönix, 12.11.2012	Lidocaine	12163801	1
Caelo	Lidocaine	12163802	1
Caelo	Lidocaine	12163803	3
Caelo	Lidocaine	12163804	3
Caelo	Lidocaine	12163811	4
Caelo	Lidocaine	12163813	5
Caelo	Lidocaine	12294405	4
Caelo	Lidocaine	122294405	1
Caelo	Lidocaine	12294408	1
Caelo	Lidocaine	12294412	7
Caelo	Lidocaine	12294411	2
Phönix 13.05.2013	Lidocaine	12B27-N04	1
Caesar & Loretz GmbH	Lidocaine	12294412	1
Phönix Gotha	Lidocaine	12C08-N11	1
Fagron	Lidocaine	12C08-N11	1
Fagron	Lidocaine	12c8-n11	1
Fagron	Lidocaine	12E30-N10	10
Fargon	Lidocaine	12E30-N10	1
Anzag	Lidocaine	12E30-N10	1
Fagron	Lidocaine	12h16n05	1
Fagron	Lidocaine	12H16-N05	6
Fagron	Lidocaine	12h16-N05	1
Fagron	Lidocaine	12H16-n05	1
Sanacorp	Lidocaine	12H16-N05	1
Noweda	Lidocaine	12H16-N05	1
Gehe	Lidocaine	12H16-N05	1
Fagron	Lidocaine	12I12-N06	1
Fagron	Lidocaine	12I21N06	1
Anzag 07.03.2013	Lidocaine	12K13-N01	1
Sanacorp	Lidocaine	12I21-N06	1
Fagron	Lidocaine	12I21-N06	3
Fagron	Lidocaine	12K13-N01	2
Euro OTC	Lidocaine	1310023-02	1
Caelo	Lidocaine	13352405	1
Caelo	Lidocaine	13352408	8
Caelo	Lidocaine	13352411	5
Phönix	Lidocaine	13B27-N04	1
Fagron	Lidocaine	13B27-N04	8
Caelo	Lidocaine	13352414	1
Caelo	Lidocaine	13352415	1
Fagron	Lidocaine	13H05-N05	9
Fagron	Lidocaine	13E28-B40-289433	1
Gehe am 22.01.2014	Lidocaine	13H05-N05	3
Fagron	Lidocaine	13B27N04	1
Fagron	Lidocaine	13H05-N050115/280	1
Fagron	Lidocaine	13J30-B02	6

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Lidocaine	13H05-N050171/245	1
Fagron	Lidocaine	13J30-b02-287639	1
Fagron	Lidocaine	13j30-B02-287639	1
PHOENIX 22.08.2014	Lidocaine	13J30-B02-287640	1
Fagron	Lidocaine	13J30-B02-287641	4
Fagron	Lidocaine	13J30-B02-292219	3
GEHE 02.12.2014	Lidocaine	13J30-B02-292220	1
Fagron	Lidocaine	13j30B02292219	1
Fagron	Lidocaine	13J30-B02-292220	2
Fagron	Lidocaine	13J30-B02-292221	4
Caelo	Lidocaine	14299301	2
Fagron	Lidocaine	14E13-B05-295549	3
Caelo	Lidocaine	14299305	2
Fagron	Lidocaine	14E13-B05	1
Gehe Kassel	Lidocaine	14E13-B05-295550	1
Fagron	Lidocaine	14E13-B05-295550	2
Caelo	Lidocaine	15212001	2
Fagron	Lidocaine	14E13-B05-295552	1
Fargron	Lidocaine	14E13-B05-295552	1
Caelo	Lidocaine	15212002	3
Caelo	Lidocaine	15332303	1
Rondell Apotheke	Lidocaine	15332304	1
Fagron	Lidocaine	15A15-B01	1
Moehs BCN S.L. / Noweda	Lidocaine	15332305	1
Caelo	Lidocaine	15332305	1
Phoenix	Lidocaine	15332305	1
Fagron	Lidocaine	15A15-B01-304282	3
Phönix Gotha	Lidocaine	15A15-B01-304284	1
Fagron	Lidocaine	15A15-B01-304283	1
Fagron	Lidocaine	15A15B01304284	1
Fagron	Lidocaine	15A15-B01-304284	4
Fagron	Lidocaine	15D23-B08309882	1
Caelo	Lidocaine	15D23-B08	1
Fagron	Lidocaine	15D23-B08312058	1
Fagron	Lidocaine	15D23B08311708	1
Fagron	Lidocaine	15D23-B08-312058	3
Fagron	Lidocaine	15H27-B07	1
Caelo	Lidocaine	16087704	3
Caelo	Lidocaine	16087712	2
Caesar & Loretz GmbH Hi...	Lidocaine	16087709	1
Fagron	Lidocaine	16F21-B06-323670	2
Fagron	Lidocaine		1
Fagron	Lidocaine	312/1	1
Caelo	Lidocaine	2811M-03584	1
PHOENIX 22.08.2014	Lidocaine		2
Gehe 09.07.2013	Lidocaine	8565948	1
Noweda	Lidocaine	5308e-07003	1
Caelo	Lidocaine	8629595	1
Fagron	Lidocaine	1014I-07006	1
Caelo	Lidocaine	11K17-N03	1
Caelo	Lidocaine	12H16-N05	1
Gutenberg-Apotheke	Lidocaine	13J30-B02	1
Caelo	Lidocaine	13352413	1
Caelo	Lidocaine	15332310	1
Fagron	Lidocaine	15d23-b08-312058	1
Caelo	Lidocaine	16087709	1

- 55 778 spectra from 335 *Apo-Ident* customers from a total of 20 521 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lidocaine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lidocaine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	150	10	81 188
Type C	0	221	2	55 778

The substance/substance group *Lidocaine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	93.7500 % (> 91.8750 %)
Type C	100.0000 % (> 99.8622 %)	99.1031 % (> 97.7578 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20942	20942	0.00	44.28
21640	22984	5.97	43.98
21673	22984	18.28	44.64
22984	22984	0.00	41.56

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Lidocaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20093-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lidocaine hydrochloride; Lidocaini hydrochloridum; Lidocainum hydrochloricum

Special notes

When selecting the *Lidocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lidocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Lidocaine hydroc...	12135511	20882	40	AR-15-FG-008867-01
Euro OTC	Lidocaine hydroc...	1403025-02	21613	40	20140516
Euro OTC	Lidocaine hydroc...	1411010	21770	40	0000009260

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lidocaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Lidocaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Lidocaine hydrochloride	1403025-02	21613 [†]	20
Euro OTC	Lidocaine hydrochloride	1411010	21770 [†]	20
Euro OTC	Lidocaine hydrochloride	1606024	22702	40
Caelo	Lidocaine hydrochloride	162222	22771	40
Caelo	Lidocaine hydrochloride	152995	22772	40
Euro OTC	Lidocaine hydrochloride	1612015	22980	40

- 81 148 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 535 spectra from 187 *Apo-Ident* customers from 149 batches from the substance/substance group *Lidocaine hydrochloride*.

[†]These spectra were recorded from 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
Euro OTC	Lidocaine hydrochloride	1202035-01	27
Euro OTC	Lidocaine hydrochloride	1108017-01	6
Caelo	Lidocaine hydrochloride	1010024-01	2
Euro OTC	Lidocaine hydrochloride	120203501	2
Euro OTC	Lidocaine hydrochloride	1202035-02	39
Euro OTC	Lidocaine hydrochloride	1202035-03	13
Konduskar/Phönix	Lidocaine hydrochloride	1202035-03	1
Caelo	Lidocaine hydrochloride	12021503	1
Caelo	Lidocaine hydrochloride	13118803	6
Caelo	Lidocaine hydrochloride	12176103	9
Caelo	Lidocaine hydrochloride	13118807	6
Caelo	Lidocaine hydrochloride	13118811	2
Caelo	Lidocaine hydrochloride	13118808	4
Caelo	Lidocaine hydrochloride	13343002	5
Caesar & Loretz GmbH	Lidocaine hydrochloride	13343002	1
Caelo	Lidocaine hydrochloride	13343001	1
Caelo	Lidocaine hydrochloride	13343003	5
Caelo	Lidocaine hydrochloride	13343004	6
Caelo	Lidocaine hydrochloride	13118812	2
Caelo	Lidocaine hydrochloride	13343007	10
Caelo	Lidocaine hydrochloride	13343008	3
Caelo	Lidocaine hydrochloride	13343011	2
Caelo	Lidocaine hydrochloride	13343012	14
Caelo	Lidocaine hydrochloride	13343014	5
Caelo	Lidocaine hydrochloride	13343015	3
Caelo	Lidocaine hydrochloride	13343016	2
Caelo	Lidocaine hydrochloride	13343019	4
Caelo	Lidocaine hydrochloride	13343017	1
Fagron	Lidocaine hydrochloride	13F07-N06	7
Euro OTC	Lidocaine hydrochloride	1401010-01	1
Fagron	Lidocaine hydrochloride	13L18-B11-286901	1
Euro OTC	Lidocaine hydrochloride	1403025-01	15
PHOENIX 17.06.2014	Lidocaine hydrochloride	1403025-01	1
Euro OTC	Lidocaine hydrochloride	140302501	2
Euro OTC	Lidocaine hydrochloride	1403025-02	13
Caelo	Lidocaine hydrochloride	1403025-02	3
Euro OTC	Lidocaine hydrochloride	140302502	1
Euro OTC	Lidocaine hydrochloride	1411010-01	19
Euro OTC	Lidocaine hydrochloride	141101001	2
Euro OTC	Lidocaine hydrochloride	1403025-03	1
Gehe	Lidocaine hydrochloride	1411010-01	1
Euro OTC	Lidocaine hydrochloride	1411010-02	10
Phönix Gotha	Lidocaine hydrochloride	1411010-02	1
Caelo	Lidocaine hydrochloride	1411010-02	1
Euro OTC	Lidocaine hydrochloride	141101-01	1
Euro OTC	Lidocaine hydrochloride	1411010-2	1
Euro OTC	Lidocaine hydrochloride	14110101-01	1
Euro/Phönix	Lidocaine hydrochloride	141101010-01	1
Fagron	Lidocaine hydrochloride	14B12-B03-292214	6
Caelo	Lidocaine hydrochloride	14254001	3
Alliance health	Lidocaine hydrochloride	14B12-B03-292214	1
Fagron	Lidocaine hydrochloride	14E13-B06-294975	5
Fagron	Lidocaine hydrochloride	14e13-b06-294975	1
Fagron	Lidocaine hydrochloride	14J07-B04-299433	3
Fagron	Lidocaine hydrochloride	14J20-B05-303131	1
Caelo	Lidocaine hydrochloride	14J20-B05-303133	1
Fagron	Lidocaine hydrochloride	14J20-B05-303133	2
Fagron	Lidocaine hydrochloride	15/17-B01-316805	1
Mahendra Chem./Noweda	Lidocaine hydrochloride	1505023	1
Euro OTC	Lidocaine hydrochloride	1505023-01	22

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	1505023-01	3
Euro OTC	Lidocaine hydrochloride	1505023-02	6
Euro OTC	Lidocaine hydrochloride	1505023-03	2
Caelo	Lidocaine hydrochloride	1505023-03	2
Euro/Alliance Healthcare	Lidocaine hydrochloride	150523-01	1
Caelo	Lidocaine hydrochloride	1517-B01-315828	1
Caelo	Lidocaine hydrochloride	1515I-01775	1
Caesar & Loretz GmbH	Lidocaine hydrochloride	15215201	1
Caelo	Lidocaine hydrochloride	1521304	1
Caelo	Lidocaine hydrochloride	15215201	2
Caelo	Lidocaine hydrochloride	15215303	2
Caelo	Lidocaine hydrochloride	15215304	3
Caesar&Loretz GmbH /Anzag	Lidocaine hydrochloride	15215303	1
Caelo	Lidocaine hydrochloride	15215301	3
Gehe	Lidocaine hydrochloride	15215304	1
Caelo	Lidocaine hydrochloride	15215308	2
Rondell Apotheke	Lidocaine hydrochloride	15215308	1
Caelo	Lidocaine hydrochloride	15215309	1
Caelo	Lidocaine hydrochloride	15215311	3
Caelo	Lidocaine hydrochloride	15215310	5
Caelo	Lidocaine hydrochloride	15215312	1
Caelo	Lidocaine hydrochloride	152951602714117	1
Caelo	Lidocaine hydrochloride	15299503	5
Caelo	Lidocaine hydrochloride	15299506	2
Caelo	Lidocaine hydrochloride	15299509	1
Caelo	Lidocaine hydrochloride	15299514	3
Fagron	Lidocaine hydrochloride	15I17-B01-315828	1
Caelo	Lidocaine hydrochloride	160113	1
Euro OTC	Lidocaine hydrochloride	1606021-01	1
Caelo	Lidocaine hydrochloride	15299516	1
Euro OTC	Lidocaine hydrochloride	1606024-01	2
Ensbona/ Sanacorp	Lidocaine hydrochloride	1606024-01	1
Swati / Noweda	Lidocaine hydrochloride	1606024-01	1
Caelo	Lidocaine hydrochloride	1606024-01	2
Caelo	Lidocaine hydrochloride	16101407	1
Caelo	Lidocaine hydrochloride	168020-0003	1
Caelo	Lidocaine hydrochloride	18041501	1
Moehs Catalana, S.L./Ph...	Lidocaine hydrochloride		1
Caelo	Lidocaine hydrochloride	1912M-01775	1
Euro OTC	Lidocaine hydrochloride	23081601	1
Caelo	Lidocaine hydrochloride	26041401	1
Caelo	Lidocaine hydrochloride	24071401	1
Caelo	Lidocaine hydrochloride	280501	1
Caelo	Lidocaine hydrochloride	4111302	1
Caelo	Lidocaine hydrochloride	29081503	1
Caelo	Lidocaine hydrochloride	5113E-01775	1
Caelo	Lidocaine hydrochloride	2051301	1
Fagron	Lidocaine hydrochloride	8F26-N07	1
Alliance Health 08.03.2...	Lidocaine hydrochloride	1010024-01	1
Caelo	Lidocaine hydrochloride	10320704	1
Caelo	Lidocaine hydrochloride	10320707	1
Noweda	Lidocaine hydrochloride	11/19-N06	1
Caelo	Lidocaine hydrochloride	10320703	1
Caelo	Lidocaine hydrochloride	10320719	1
Noweda	Lidocaine hydrochloride	1108017-01	1
Caelo	Lidocaine hydrochloride	10320717	1
Fagron	Lidocaine hydrochloride	9E08-N03	1
Euro OTC	Lidocaine hydrochloride	1108017-02	9
Noweda	Lidocaine hydrochloride	1108017-02	1
EuRho/Phoenix	Lidocaine hydrochloride	1108017-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	11091203	1
Caelo	Lidocaine hydrochloride	113002905	1
Caelo	Lidocaine hydrochloride	11302902	2
Caelo	Lidocaine hydrochloride	11302904	1
Caelo	Lidocaine hydrochloride	12020302	1
Caelo	Lidocaine hydrochloride	11302906	3
Caelo	Lidocaine hydrochloride	11302905	1
Fagron	Lidocaine hydrochloride	11H18-N01	2
Fagron	Lidocaine hydrochloride	11L09-N09	2
Euro OTC	Lidocaine hydrochloride	1202034-01	2
Euro OTC	Lidocaine hydrochloride	1202035/02	1
Euro OTC	Lidocaine hydrochloride	1202035	1
Caelo	Lidocaine hydrochloride	120203501	1
Sanacorp	Lidocaine hydrochloride	1202035-01	3
Finze	Lidocaine hydrochloride	1202035-01	1
Gehe	Lidocaine hydrochloride	1202035-01	1
Caelo	Lidocaine hydrochloride	1202035-02	2
Euro OTC	Lidocaine hydrochloride	120203502	4
Gehe	Lidocaine hydrochloride	1202035-02	1
PHOENIX am 12.02.2014	Lidocaine hydrochloride	1202035-02	1
Phönix	Lidocaine hydrochloride	1202035-03	1
Caelo	Lidocaine hydrochloride	1202035-03	1
Noweda	Lidocaine hydrochloride	1202035-03	1
Euro OTC	Lidocaine hydrochloride	1202035-1	1
Caelo	Lidocaine hydrochloride	12135503	6
Caelo	Lidocaine hydrochloride	12135504	3
Caelo	Lidocaine hydrochloride	12135508	6
Caelo	Lidocaine hydrochloride	12135509	4
Großhandel	Lidocaine hydrochloride	12135511	1
Caelo	Lidocaine hydrochloride	12135511	2
Fiebig 04.7.13 EK 4,54	Lidocaine hydrochloride	12135511	1
Caelo	Lidocaine hydrochloride	12176101	8
Caelo	Lidocaine hydrochloride	12176102	10
Caelo	Lidocaine hydrochloride	12176109	2
Fagron	Lidocaine hydrochloride	12C05-N02	4
Fagron	Lidocaine hydrochloride	12H09-N08	3
Fagron	Lidocaine hydrochloride	12E14-N04	3
Fagron	Lidocaine hydrochloride	12c05-N02	1
Caelo	Lidocaine hydrochloride	13118802	2
Caesar&Loretz GmbH/Anzag	Lidocaine hydrochloride	13118803	2
Caelo	Lidocaine hydrochloride	13118806	1
Hedinger/Ebert	Lidocaine hydrochloride	13118807	1
Sanacorp	Lidocaine hydrochloride	13118807	1
Fagron	Lidocaine hydrochloride	13F07N06	1
Caolo	Lidocaine hydrochloride	13343008	1
Fagron	Lidocaine hydrochloride	14e13-b06-294973	1
Fagron	Lidocaine hydrochloride	14J07-B04-299434	1
Euro OTC	Lidocaine hydrochloride	2213U01775	1
Caelo	Lidocaine hydrochloride	23011403	1
Euro OTC	Lidocaine hydrochloride	20131010-4	1
Caelo	Lidocaine hydrochloride	25091202	1
Euro OTC	Lidocaine hydrochloride	2810029-01	1
Euro OTC	Lidocaine hydrochloride	2805016-01	1
Caelo	Lidocaine hydrochloride	AKD14	1
Fagron	Lidocaine hydrochloride	9B3M1L2Fo118	1
Euro OTC	Lidocaine hydrochloride	2911029-01	1
Caelo	Lidocaine hydrochloride	72702128	1
Euro OTC	Lidocaine hydrochloride	LID-20-11-001	2
Caelo	Lidocaine hydrochloride	5211E-01775	1
Fagron	Lidocaine hydrochloride	13L18-B11-286903	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lidocaine hydrochloride	14110101	1
Fagron	Lidocaine hydrochloride	15I17-B01-316805	1
Euro OTC	Lidocaine hydrochloride	1103034-01	1
Euro OTC	Lidocaine hydrochloride	141101002	1
Caelo	Lidocaine hydrochloride	1814U-01775	1
Caelo	Lidocaine hydrochloride	P155/14	1
A.H.D.	Lidocaine hydrochloride	1202035-02	1
Großhandel	Lidocaine hydrochloride	13343002	1
Caelo	Lidocaine hydrochloride	26071303	1

- 55 466 spectra from 334 *Apo-Ident* customers from a total of 20 466 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lidocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lidocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	200	0	81 148
Type C	0	520	15	55 466

The substance/substance group *Lidocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.1963 % (> 96.6355 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20882	20882	0.00	48.86
21613	21770	6.84	47.44
21770	21770	0.00	51.89

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-isoleucine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21045-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-isoleucine; L-Isoleucinum

Special notes

When selecting the *L-isoleucine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-isoleucine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-isoleucine	13E02-B01-286930	21045	40	1403154
Fagron	L-isoleucine	13E02-B01	21332	40	20130621
Euro OTC	L-isoleucine	1604057	22566	40	20160601*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *L-isoleucine*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 4 reference samples from the substance/substance group *L-isoleucine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-isoleucine	11F30-N06	20417	40
Euro OTC	L-isoleucine	L1211010-02	21535	60
Euro OTC	L-isoleucine	L1211010-02	21581	60
Euro OTC	L-isoleucine	1611007	22869	40

- 81 148 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *L-isoleucine*.

Supplier	Substance	Batch	Spectra
Fagron	L-isoleucine	12H30-N03	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	L-isoleucine	13E02-B01-286930	1
Fagron	L-isoleucine	11C31-N07	1
Fagron	L-isoleucine	15A14-B09	1
Fagron	L-isoleucine	121101	1
Fagron	L-isoleucine	13E02-B01-291112	1
Fagron	L-isoleucine	8166210302	1
Fagron	L-isoleucine	13A22-N03	1
Fagron	L-isoleucine	12080167	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-isoleucine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-isoleucine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	161	39	81 148
Type C	0	9	0	55 992

The substance/substance group *L-isoleucine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	80.5000 % (> 79.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21045	21045	0.00	12.76
21332	21045	5.25	12.83
22566	22566	0.00	12.64

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Lithium orotate monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21055-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lithium orotate monohydrate; Lithii orotas monohydricum

Special notes

When selecting the *Lithium orotate monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lithium orotate monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Lithium orotate ...	13J04-N01	21055	40	1405616
Fagron	Lithium orotate ...	13I09-B04-290311	21688	40	20130927
Fagron	Lithium orotate ...	15F25-B01-315219	22502	40	20150716

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lithium orotate monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Lithium orotate monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Lithium orotate monohydrate	10F25-N01	20437	40
Fagron	Lithium orotate monohydrate	13I09-B04-290311	21688 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Lithium orotate monohydrate*.

Supplier	Substance	Batch	Spectra
Pharmorgana	Lithium orotate monohydrate	ORL00212	4
Microsin	Lithium orotate monohydrate	ORL00315	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
Pfannenschmidt	Lithium orotate monohydrate	0RL00212	1
Fagron	Lithium orotate monohydrate	13J04-N01	1

- 55 994 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lithium orotate monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lithium orotate monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	60	0	81 288
Type C	0	7	0	55 994

The substance/substance group *Lithium orotate monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21055	21055	0.00	80.31
21688	21055	3.64	80.35
22502	21055	13.85	81.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-leucine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20970-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-leucine; Leucinum

Special notes

When selecting the *L-leucine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-leucine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-leucine	13J09-N03	20970	40	1402431
Euro OTC	L-leucine	1302013-01	21612	40	20130320
Euro OTC	L-leucine	1601032	22380	40	20160308*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *L-leucine*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *L-leucine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-leucine	9D27-N04	20443	40
Euro OTC	L-leucine	1302013-01	21612 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 4 batches from the substance/substance group *L-leucine*.

Supplier	Substance	Batch	Spectra
Euro OTC	L-leucine	L1208003-01	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Euro OTC	L-leucine	1312032-01	2
Fargon	L-leucine	8160410903	1
Fargon	L-leucine	13J09-N03	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-leucine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-leucine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	37	23	81 288
Type C	0	4	1	55 996

The substance/substance group *L-leucine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	61.6667 % (> 56.6667 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20970	20970	0.00	19.66
21612	20970	8.53	20.48
22380	22380	0.00	20.55

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-malic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22357-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-malic acid; Acidum-(L)-malicum

Special notes

When selecting the *L-malic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-malic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-malic acid	15J09-B03-313987	22357	40	9346
Fagron	L-malic acid	15J09-B03-313987	22730	40	20151106

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *L-malic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *L-malic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-malic acid	15J09-B03-313987	22357 [†]	20
Fagron	L-malic acid	15J09-B03-313987	22612	40

- 81 288 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *L-malic acid*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *L-malic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-malic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	0	0	56 001

The substance/substance group *L-malic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22357	22357	0.00	62.83
22730	22357	3.81	63.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-phenylalanine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21661-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-phenylalanine; Phenylalaninum

Special notes

When selecting the *L-phenylalanine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-phenylalanine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	L-phenylalanine	14088304	21661	40	1501656
Euro OTC	L-phenylalanine	1212014-03	21681	40	20130111

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *L-phenylalanine*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 52 spectra of 3 reference samples from the substance/substance group *L-phenylalanine*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	L-phenylalanine	14088304	21661 [†]	20
Euro OTC	L-phenylalanine	1212014-03	21681 [†]	20
Euro OTC	L-phenylalanine	1409013-02	not required	12

- 81 296 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *L-phenylalanine*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-phenylalanine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-phenylalanine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	52	0	81 296
Type C	0	0	0	56 001

The substance/substance group *L-phenylalanine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 88.4615 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21661	21661	0.00	49.67
21681	21661	22.12	57.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-proline**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21034-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-proline; Prolinum

Special notes

When selecting the *L-proline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-proline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-proline	15D13-B02-308152	22270	40	1704059
Euro OTC	L-proline	1606010	22677	40	20160714*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group L-proline. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 6 reference samples from the substance/substance group L-proline.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	L-proline	P-07014859	20368	40
Euro OTC	L-proline	L1210046-02	21034	40
Euro OTC	L-proline	L1210046-02	21075	60
Euro OTC	L-proline	L1210046-01	21103	40
Fagron	L-proline	15D13-B02-308152	22270 [†]	20
Euro OTC	L-proline	1606010-01	23013	40

- 81 108 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 L-proline.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	L-proline	L1210046-03	2
Euro OTC	L-proline	1312029-01	1
Euro OTC	L-proline	L1210045-01	1

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-proline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-proline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	67	173	81 108
Type C	0	2	2	55 997

The substance/substance group *L-proline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	27.9167 % (> 26.6667 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22270	22270	0.00	40.58
22677	22677	0.00	39.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-serine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22289-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-serine; Serinum

Special notes

When selecting the L-serine substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group L-serine:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	L-serine	1512012	22289	40	20160112*
Euro OTC	L-serine	1606020-01	22668	40	20160714

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *L-serine*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *L-serine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	L-serine	1512012	22289 [†]	20
Euro OTC	L-serine	1606020	22678	40
Euro OTC	L-serine	1611006	22922	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *L-serine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-serine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-serine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	100	0	81 248
Type C	0	0	0	56 001

The substance/substance group *L-serine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22289	22289	0.00	51.89
22668	22289	5.73	48.47

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-threonine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20734-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-threonine; Threoninum

Special notes

When selecting the *L-threonine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-threonine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-threonine	12H02-N03	20734	40	1402580
Euro OTC	L-threonine	1210027-01	21033	40	1403152
Euro OTC	L-threonine	1210027-01	22319	40	20121108
Euro OTC	L-threonine	1601031	22378	40	20160225*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *L-threonine*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *L-threonine*.

Supplier	Substance	Batch	Sample ID	Spectra
Pharmorgana	L-threonine	1000110839	20410	40
Euro OTC	L-threonine	1210027-01	22319 [†]	20
Euro OTC	L-threonine	1606019	22679	40
Euro OTC	L-threonine	1609014	22792	40

- 81 208 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 7 spectra from 2 *Apo-Ident* customers from 5 batches from the substance/substance group *L-threonine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	L-threonine	1210027-02	2
Pharmorgana	L-threonine	100110839	1
Euro OTC	L-threonine	1210027-01	2
Euro OTC	L-threonine	1111015-01	1
Fargon	L-threonine	2114720407	1

- 55 994 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-threonine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-threonine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	140	0	81 208
Type C	0	7	0	55 994

The substance/substance group *L-threonine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20734	20734	0.00	72.70
21033	21033	0.00	65.74
22319	20734	5.07	67.45
22378	22378	0.00	75.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **L-tryptophan**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20336-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

L-tryptophan; Tryptophanum

Special notes

When selecting the *L-tryptophan* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *L-tryptophan*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	L-tryptophan	11G25-N02	20336	40	20110805
Fagron	L-tryptophan	09L28-N03	20369	40	20091229
Fagron	L-tryptophan	10I28-806	20387	40	AR-13-FG-000201-01
Fagron	L-tryptophan	14B05-B32-293485	21784	40	AR-15-FG-009473-01
Euro OTC	L-tryptophan	1506003	21866	40	0000010317
Euro OTC	L-tryptophan	1506003	21871	40	0000010317

Validation samples

A total of 213 227 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 *L-tryotophan*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *L-tryotophan*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	L-tryotophan	14B05-B32-293485	21784 [†]	20
Euro OTC	L-tryotophan	1506003	21866 [†]	20
Euro OTC	L-tryotophan	1506003	21871 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 23 spectra from 7 *Apo-Ident* customers from 12 batches from the substance/substance group *L-tryotophan*.

[†]These spectra were recorded from 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
Pharmorgana	L-tryptophan	1000140147	1
Fagron	L-tryptophan	13J10-N03	2
Fagron	L-tryptophan	11D15-N04	1
Fagron	L-tryptophan	11G25-N02	3
Caelo	L-tryptophan	131046	1
Fagron	L-tryptophan	Ch12K02-N05	1
Euro OTC	L-tryptophan	1111044-01	1
Euro OTC	L-tryptophan	1212010-01	1
euroct/gehe	L-tryptophan	1212010-01	5
Euro OTC	L-tryptophan	1302021-01	1
Euro OTC	L-tryptophan	1307004-01	3
Euro OTC	L-tryptophan	1404027-01	2
Fagron	L-tryptophan	12B14-N15	1

- 55 978 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *L-tryptophan* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *L-tryptophan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 638
Type B	0	60	0	81 288
Type C	0	23	0	55 978

The substance/substance group *L-tryptophan* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20336	21784	2.69	35.35
20369	20387	1.60	40.66
20387	20387	0.00	41.76
21784	21784	0.00	48.94
21866	21866	0.00	44.03
21871	21871	0.00	44.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Lysine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20385-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Lysine hydrochloride; Lysine HCl; Lysini hydrochloridum; Lysini hydrochloridum Inf

Special notes

When selecting the *Lysine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Lysine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Lysine hydrochlo...	L1103041-01	20385	40	AR-12-FG-007558-01
Fagron	Lysine hydrochlo...	15B09-B06-304170	21963	40	20150220
Fagron	Lysine hydrochlo...	14H20-B03-301894	21983	40	AR-16-FG-005856-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Lysine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 6 reference samples from the substance/substance group *Lysine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Lysine hydrochloride	P-07014932	20402	40
Fagron	Lysine hydrochloride	12B14-N08	20735	40
Fagron	Lysine hydrochloride	15B09-B06-304170	21963 [†]	20
Fagron	Lysine hydrochloride	14H20-B03-301894	21983 [†]	20
Euro OTC	Lysine hydrochloride	1603011	22527	40
Euro OTC	Lysine hydrochloride	1611021	22865	40

- 81 148 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 3 *Apo-Ident* customers from 4 batches from the substance/substance group *Lysine hydrochloride*.

[†]These spectra were recorded from 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
Euro OTC	Lysine hydrochloride	L1304015-01	5
Euro OTC	Lysine hydrochloride	L1209002-1	1
Euro OTC	Lysine hydrochloride	L1205030-01	1
Fagron	Lysine hydrochloride	2167210405	1
AHD	Lysine hydrochloride	L1304015-01	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Lysine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Lysine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	120	80	81 148
Type C	0	8	1	55 992

The substance/substance group *Lysine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	60.0000 % (> 58.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20385	20385	0.00	33.92
21963	21983	3.03	30.09
21983	21983	0.00	29.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Macrogol 1500**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20112-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Macrogol 1500; Macrogolum 1500; Polyäthylenglycolum 1500

Special notes

When selecting the *Macrogol 1500* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Macrogol 1500*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Macrogol 1500	10037704	20112	60	20100216
Caelo	Macrogol 1500	12324607	20977	40	1403323
Euro OTC	Macrogol 1500	1508002	21948	40	20150810*
Euro OTC	Macrogol 1500	1604005	22544	40	20160512*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 4 reference samples from the substance/substance group *Macrogol 1500*. These samples are listed above in the [calibration samples](#) section.
- 75 698 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 30 spectra of 2 reference samples from the substance/substance group *Macrogol 1500*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Macrogol 1500	10037704	20112 [†]	10
Euro OTC	Macrogol 1500	1508002	21948 [†]	20

- 81 318 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 40 spectra from 16 *Apo-Ident* customers from 18 batches from the substance/substance group *Macrogol 1500*.

Supplier	Substance	Batch	Spectra
Euro OTC	Macrogol 1500	1304023-01	7

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Euro OTC	Macrogol 1500	1406004-01	2
Gehe	Macrogol 1500	14072409	1
Caelo	Macrogol 1500	13140902	2
Phönix	Macrogol 1500	14072402	1
Caelo	Macrogol 1500	14072412	1
Euro OTC	Macrogol 1500	1503026-01	4
Caelo	Macrogol 1500	10105901	1
Caelo	Macrogol 1500	10105905	1
Caelo	Macrogol 1500	11056504	1
Euro OTC	Macrogol 1500	1206005-01	7
Caelo	Macrogol 1500	11071309	1
Caelo	Macrogol 1500	12109409	2
Anzag 21.06.2013	Macrogol 1500	12324610	1
Caelo	Macrogol 1500	13140901	1
Caelo	Macrogol 1500	13140906	2
Euro OTC	Macrogol 1500	1103017-02	4
ACM / Herba	Macrogol 1500	KN-0826/10	1

- 55 961 spectra from 335 *Apo-Ident* customers from a total of 20 593 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Macrogol 1500* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Macrogol 1500* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	75 698
Type B	0	30	0	81 318
Type C	0	35	5	55 961

The substance/substance group *Macrogol 1500* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 80.0000 %)
Type C	100.0000 % (> 99.8622 %)	87.5000 % (> 80.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20112	21948	11.45	38.08
20977	20977	0.00	28.99
21948	21948	0.00	50.37
22544	22544	0.00	45.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Macrogol 4000/6000**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20485-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Macrogol 4000/6000; Macrogol 4000; Macrogol 6000 powder, fine; Macrogolum 4000; Macrogolum 6000 plv.; Polyäthylenglycol 4000; Polyäthylenglycol 6000 plv.

Special notes

When selecting the *Macrogol 4000/6000* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Macrogol 4000/6000*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Macrogol 6000 po...	12A19-N02	20485	40	AR-13-FG-008919-01
Caelo	Macrogol 4000	12074116	20690	40	1401164
Caelo	Macrogol 4000	12318019	20975	40	1403322
Caelo	Macrogol 4000	12361502	21065	40	20130107
Caelo	Macrogol 4000	13356616	21357	40	20131107

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Macrogol 6000 po...	14C11-B01-296014	21732	40	20140324
Euro OTC	Macrogol 4000	1507004	21841	40	0000010550
Fagron	Macrogol 4000	15B13-B04-305461	21886	40	AR-16-FG-004020-01
Euro OTC	Macrogol 4000	1508031	21903	40	20150914*
Fagron	Macrogol 6000 po...	14J17-B01-309247	22342	40	20141027
Fagron	Macrogol 6000 po...	14J17-B01-309247	22394	40	AR-16-FG-011486-01
Euro OTC	Macrogol 4000	1605012	22567	40	20160606*
Euro OTC	Macrogol 4000	1605025	22570	40	20160603*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 520 spectra of 13 reference samples from the substance/substance group *Macrogol 4000/6000*. These samples are listed above in the [calibration samples](#) section.
- 75 358 spectra from a total of 1564 batches from further 382 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 295 spectra of 10 reference samples from the substance/substance group *Macrogol 4000/6000*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Macrogol 4000	10059103	20114	55
Caelo	Macrogol 4000	11172433	20692	40
Fagron	Macrogol 6000 powder, fine	14C11-B01-296014	21732 [†]	20
Euro OTC	Macrogol 4000	1507004	21841 [†]	20
Fagron	Macrogol 4000	15B13-B04-305461	21886 [†]	20
Euro OTC	Macrogol 4000	1508031	21903 [†]	20
Fagron	Macrogol 6000 powder, fine	14J17-B01-309247	22342 [†]	20
Fagron	Macrogol 6000 powder, fine	14J17-B01-309247	22394 [†]	20
Euro OTC	Macrogol 4000	1609018	22791	40
Euro OTC	Macrogol 4000	1701007	22983	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*).

- 81 053 spectra from a total of 1938 batches from further 619 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 283 spectra from 91 *Apo-Ident* customers from 142 batches from the substance/substance group *Macrogol 4000/6000*.

Supplier	Substance	Batch	Spectra
Fagron	Macrogol 4000	914I-02103	1
Euro OTC	Macrogol 4000	1005011-01	1
Caelo	Macrogol 4000	1234	1
Caelo	Macrogol 4000	1180513	1
Euro OTC	Macrogol 4000	1305020-02	3
Caelo	Macrogol 4000	123Test	1
Henry Lamotte	Macrogol 4000	1213test	1
Euro OTC	Macrogol 4000	130502002	1
Caelo	Macrogol 4000	13335102	2
Caelo	Macrogol 4000	13136011	3
Caelo	Macrogol 4000	13136016	2
Caelo	Macrogol 4000	13081501	1
Caelo	Macrogol 4000	13335107	1
Caelo	Macrogol 4000	13356601	4
Caelo	Macrogol 4000	13335120	1
Caelo	Macrogol 4000	13356609	4
Caelo	Macrogol 4000	13356616	1
ANZAG 15.05.2014	Macrogol 4000	13356616	1
GEHE 06.05.2014	Macrogol 4000	13356608	2
Caelo	Macrogol 4000	13356611	2
Caelo	Macrogol 4000	13356617	7
Caelo	Macrogol 4000	14061705	7
Caelo	Macrogol 4000	1401708	1
Fagron	Macrogol 4000	13I17-N03	1
Caelo	Macrogol 4000	13356621	1
Caelo	Macrogol 4000	14061707	5
Caelo	Macrogol 4000	14061708	13
Fagron	Macrogol 4000	14061710	1
Caelo	Macrogol 4000	14061713	1
Euro OTC	Macrogol 4000	140701001	1
Caelo	Macrogol 4000	14061712	1
Caelo	Macrogol 4000	14180503	1
Caelo	Macrogol 4000	14180512	1
Caelo	Macrogol 4000	14180511	4
Caelo	Macrogol 4000	14180513	1
Caelo	Macrogol 4000	14180520	1
Caelo	Macrogol 4000	14180508	2
Caelo	Macrogol 4000	14180522	1
Caelo	Macrogol 4000	14180525	5
Caesar & Loretz GmbH	Macrogol 4000	14180520	1

continued on the next page

Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Macrogol 4000	1418521	1
Caelo	Macrogol 4000	14196013	1
Caelo	Macrogol 4000	14352607	2
Fagron	Macrogol 4000	14352612	2
Caelo	Macrogol 4000	14352606	3
Caesar&Loretz GmbH/Anzag	Macrogol 4000	14196017	1
Caelo	Macrogol 4000	14352612	1
Caelo	Macrogol 4000	14352613	2
Caelo	Macrogol 4000	14352618	1
Fagron	Macrogol 4000	14A03B01	1
Fagron	Macrogol 4000	14A03-B01-289602	3
Fagron	Macrogol 4000	14D14-B06-293453	1
Fagron	Macrogol 4000	14D14-B06-293454	1
Fagron	Macrogol 4000	14G15-B07-295632	1
Fagron	Macrogol 4000	14A03-B01-289605	1
Euro OTC	Macrogol 4000	1507004-01	1
Fagron	Macrogol 4000	14D14-B06	1
Fagron	Macrogol 4000	14K03-b07-300522	1
Fagron	Macrogol 4000	14L12-B06-301991	1
Fagron	Macrogol 4000	14A03-B01-289603	1
Euro OTC	Macrogol 4000	1508031-02	1
Euro OTC	Macrogol 4000	1508031-01	1
Caelo	Macrogol 4000	15159506	1
Caelo	Macrogol 4000	15159504	1
Caelo	Macrogol 4000	15159505	2
Caelo	Macrogol 4000	15159514	2
Caelo	Macrogol 4000	15225001	1
Caelo	Macrogol 4000	15159515	2
Caelo	Macrogol 4000	15225003	3
Euro OTC	Macrogol 4000	15159515	1
Caelo	Macrogol 4000	15159516	2
Caelo	Macrogol 4000	15335001	2
Caelo	Macrogol 4000	15225013	1
Jenne	Macrogol 4000	15335003	6
Caelo	Macrogol 4000	15376503	1
Caelo	Macrogol 4000	15406306	1
Caelo	Macrogol 4000	15406303	3
Caelo	Macrogol 4000	15406301	1
Caelo	Macrogol 4000	1535004	1
Caelo	Macrogol 4000	16023903	1
Rondell Apotheke	Macrogol 4000	16023905	1
Phoenix	Macrogol 4000	16023905	1
Caelo	Macrogol 4000	16152001	2
Caelo	Macrogol 4000		1
Caelo	Macrogol 4000	23061505	1
Caelo	Macrogol 4000	4123585	1
Fagron	Macrogol 4000	2215I-02103	1
Caelo	Macrogol 4000	1010023-02	1
Euro OTC	Macrogol 4000	1010023-02	1
Caelo	Macrogol 4000	11172303	1
Fagron	Macrogol 4000	1112M-02103	1
Caelo	Macrogol 4000	1172404	1
Phoenix 14.05.2012	Macrogol 4000	11H01-N04	1
Caelo	Macrogol 4000	11I05-N11	1
Euro OTC	Macrogol 4000	1202040-02	3
Caelo	Macrogol 4000	12074102	1
EuRho	Macrogol 4000	1206009-01	1
Caelo	Macrogol 4000	12074109	4
Caelo	Macrogol 4000	12074116	3
Caelo	Macrogol 4000	12149115	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Macrogol 4000	12149108	1
Caelo	Macrogol 4000	12149113	2
Caelo	Macrogol 4000	12149103	1
Caelo	Macrogol 4000	12074114	2
Caelo	Macrogol 4000	12318011	2
Caelo	Macrogol 4000	12318019	2
Gehe	Macrogol 4000	1219-N13	1
Caelo	Macrogol 4000	12318027	1
Noweda	Macrogol 4000	12361502	2
Caelo	Macrogol 4000	12361502	1
Phönix Gotha	Macrogol 4000	12361502	1
Caelo	Macrogol 4000	12361506	10
Noweda	Macrogol 4000	12361512	1
Alliance Healthcare	Macrogol 4000	12361512	1
Caelo	Macrogol 4000	12361512	2
Caelo	Macrogol 4000	12361513	3
Caelo	Macrogol 4000	12361518	7
Fagron	Macrogol 4000	12A12-N07	2
Fagron	Macrogol 4000	12C29-N15	1
Fagron	Macrogol 4000	12I20-N03	1
Fagron	Macrogol 4000	12F29-N01	2
Fagron	Macrogol 4000	12F29-N01	1
Fagron	Macrogol 4000	12F13-N01	1
Fagron	Macrogol 4000	12I20-n03	1
Fagron	Macrogol 4000	12L10-N06	2
DIV GH	Macrogol 4000	13/12	1
Caelo	Macrogol 4000	13136001	4
Caelo	Macrogol 4000	13136003	3
Noweda	Macrogol 4000	13136003	1
Caelo	Macrogol 4000	13136009	3
Caelo	Macrogol 4000	13136010	1
Bombastus	Macrogol 4000	13136016	1
Caelo	Macrogol 4000	1316003	1
Caelo	Macrogol 4000	13356602	7
Fagron	Macrogol 4000	13B20N01	1
Fagron	Macrogol 4000	13B20-N01	1
Fagron	Macrogol 4000	13G19-N08	2
Sanacorp	Macrogol 4000	13B20-N01	1
Hedinger	Macrogol 4000	13G19-N08	1
Fagron	Macrogol 4000	13F12N09	1
Fagron	Macrogol 4000	13F12-N09	1
Caelo	Macrogol 4000	IntCh217002	1
Fagron	Macrogol 6000 powder, fine	14J17-B01	1
Sanacorp	Macrogol 4000	14061707	1
Fagron	Macrogol 6000 powder, fine	12J22-N02	1
Fagron	Macrogol 6000 powder, fine	11G14-N03	1
Caelo	Macrogol 4000	15335003	4
Caelo	Macrogol 4000	16152003	1
Caelo	Macrogol 4000	16023905	1
Caelo	Macrogol 4000	16267311	1
Caelo	Macrogol 4000	11172308	1
Fagron	Macrogol 4000	3114I-02103	1
Caelo	Macrogol 4000	11172319	1
Caelo	Macrogol 4000	3940608	1
Gutenberg-Apotheke	Macrogol 4000	13356609	1
Caelo	Macrogol 4000	14180526	1
Caelo	Macrogol 4000	14196007	1
Phoenix	Macrogol 4000	12258901	1
Fagron	Macrogol 4000	13136010	1
Caelo	Macrogol 4000	13335106	1

- 55 718 spectra from 335 *Apo-Ident* customers from a total of 20 472 batches from a further 682 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Macrolog 4000/6000* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Macrolog 4000/6000* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	520	0	75 358
Type B	0	295	0	81 053
Type C	0	277	6	55 718

The substance/substance group *Macrolog 4000/6000* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8462 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.9661 %)
Type C	100.0000 % (> 99.8622 %)	97.8799 % (> 96.8198 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20485	20485	0.00	50.56
20690	20690	0.00	36.16
20975	20975	0.00	36.47
21065	20690	7.72	35.44
21357	21886	5.55	32.57
21732	22394	1.83	47.56
21841	21841	0.00	30.60

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21886	21886	0.00	39.04
21903	21903	0.00	44.80
22342	22394	0.70	47.34
22394	22394	0.00	46.70
22567	22567	0.00	29.38
22570	22570	0.00	39.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium (hydrogen) citrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20016-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium (hydrogen) citrate; Magnesii hydrogenocitras hydricus; Magnesii hydrogenocitricum

Special notes

When selecting the *Magnesium (hydrogen) citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium (hydrogen) citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Magnesium (hydro...	90396239	20016	60	I 2009 000 309
Caelo	Magnesium (hydro...	11372907	20595	40	20120105
Euro OTC	Magnesium (hydro...	1110026-02	20599	40	1402474
Caelo	Magnesium (hydro...	13389102	21445	40	20131205
Euro OTC	Magnesium (hydro...	1507010	21873	40	0000010589
Euro OTC	Magnesium (hydro...	1510033	22233	40	20151117*
Euro OTC	Magnesium (hydro...	1601005	22296	40	20160119*
Euro OTC	Magnesium (hydro...	1701003	22992	40	20170124*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 340 spectra of 8 reference samples from the substance/substance group *Magnesium (hydrogen) citrate*. These samples are listed above in the [calibration samples](#) section.
- 75 538 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 255 spectra of 9 reference samples from the substance/substance group *Magnesium (hydrogen) citrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Magnesium (hydrogen) citrate	90396239	20016 [†]	15
Dr. Paul Lohmann	Magnesium (hydrogen) citrate	1048115	20615	40
Caelo	Magnesium (hydrogen) citrate	13389102	21445 [†]	20
Euro OTC	Magnesium (hydrogen) citrate	1507010	21873 [†]	20
Euro OTC	Magnesium (hydrogen) citrate	1510033	22233 [†]	20
Euro OTC	Magnesium (hydrogen) citrate	1601005	22296 [†]	20
Euro OTC	Magnesium (hydrogen) citrate	1604002	22509	40
Euro OTC	Magnesium (hydrogen) citrate	1608004	22796	40
Euro OTC	Magnesium (hydrogen) citrate	1701004	22991	40

- 81 093 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 367 spectra from 107 *Apo-Ident* customers from 147 batches from the substance/substance group *Magnesium (hydrogen) citrate*.

Supplier	Substance	Batch	Spectra
Caelo	Magnesium (hydrogen) citrate	14265516	1
Caelo	Magnesium (hydrogen) citrate	15296709	4
Caelo	Magnesium (hydrogen) citrate	15296801	4
Caelo	Magnesium (hydrogen) citrate	15415005	2
Caelo	Magnesium (hydrogen) citrate	15415010	3
	Magnesium (hydrogen) citrate	1058172	1
Euro OTC	Magnesium (hydrogen) citrate	1604002-01	7
Caelo	Magnesium (hydrogen) citrate	12175807	3
Caelo	Magnesium (hydrogen) citrate	12175810	3
Fagron	Magnesium (hydrogen) citrate	10D28-N22	1
Euro OTC	Magnesium (hydrogen) citrate	1110026-01	3
GEHE	Magnesium (hydrogen) citrate	1110026-02	1
Caelo	Magnesium (hydrogen) citrate	11193115	1
Caelo	Magnesium (hydrogen) citrate	1137199	1
Caelo	Magnesium (hydrogen) citrate	11372901	4
Caelo	Magnesium (hydrogen) citrate	11372902	1
Caelo	Magnesium (hydrogen) citrate	12175802	7
Caelo	Magnesium (hydrogen) citrate	12091303	1
Caelo	Magnesium (hydrogen) citrate	1137291	1
Caelo	Magnesium (hydrogen) citrate	12238002	7
Fagron	Magnesium (hydrogen) citrate	11H05-N07	1
Caelo	Magnesium (hydrogen) citrate	12238012	3
Caelo	Magnesium (hydrogen) citrate	12368003	9
Caelo	Magnesium (hydrogen) citrate	12368004	6
Fagron	Magnesium (hydrogen) citrate	12A30-N03	2
Fagron	Magnesium (hydrogen) citrate	12A30-N30	1
Fagron	Magnesium (hydrogen) citrate	12G10-N01	3
Fagron	Magnesium (hydrogen) citrate	12H28-N11	4
Caelo	Magnesium (hydrogen) citrate	26101203	1
Caelo	Magnesium (hydrogen) citrate	7011504	1
Caelo	Magnesium (hydrogen) citrate	1014E-01829	1
Euro OTC	Magnesium (hydrogen) citrate	1306034-02	4
Caelo	Magnesium (hydrogen) citrate	13233913	5
Euro OTC	Magnesium (hydrogen) citrate	1311003-01	13
Caelo	Magnesium (hydrogen) citrate	13233910	3
Dr. Paul Lohmann	Magnesium (hydrogen) citrate	1077866	2
Gutenberg-Apotheke	Magnesium (hydrogen) citrate	13233913	2
Caelo	Magnesium (hydrogen) citrate	13233907	2
Caelo	Magnesium (hydrogen) citrate	13389111	2
Euro OTC	Magnesium (hydrogen) citrate	1407048-01	3
Alliance Health 05.09.2...	Magnesium (hydrogen) citrate	13389111	2
Euro OTC	Magnesium (hydrogen) citrate	1407048-02	4
Caelo	Magnesium (hydrogen) citrate	14265503	10
Caelo	Magnesium (hydrogen) citrate		1
Caelo	Magnesium (hydrogen) citrate	14265517	1
Nowed18.08.2015	Magnesium (hydrogen) citrate	14265521	1
Euro OTC	Magnesium (hydrogen) citrate	1507010-01	4
Fagron	Magnesium (hydrogen) citrate	14I12-B02-298854	1
Fagron	Magnesium (hydrogen) citrate	14K27-B03-305254	1
Caelo	Magnesium (hydrogen) citrate	15296701	4
Caelo	Magnesium (hydrogen) citrate	15415001	1
Caelo	Magnesium (hydrogen) citrate	15415002	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Dr. Paul Lohmann	Magnesium (hydrogen) citrate	1079474	1
Gehe/EuRho	Magnesium (hydrogen) citrate	112E-01829	1
Eu Rho	Magnesium (hydrogen) citrate	110600401	1
Phoenix 30.07.2012	Magnesium (hydrogen) citrate	1202034-01	1
Euro OTC	Magnesium (hydrogen) citrate	1202034	1
Eu Rho	Magnesium (hydrogen) citrate	1202034-01	1
Euro OTC	Magnesium (hydrogen) citrate	1202034-01	2
EuRho/Phönix	Magnesium (hydrogen) citrate	1202034-02	1
Euro OTC	Magnesium (hydrogen) citrate	1208006-01	5
Gehe 18.06.2013	Magnesium (hydrogen) citrate	1208006-02	1
Euro OTC	Magnesium (hydrogen) citrate	1211033-02	4
Caelo	Magnesium (hydrogen) citrate	12175801	1
Caelo	Magnesium (hydrogen) citrate	12175804	2
Caelo	Magnesium (hydrogen) citrate	14265520	1
Euro OTC	Magnesium (hydrogen) citrate		1
Gehe	Magnesium (hydrogen) citrate	12368014	1
Euro OTC	Magnesium (hydrogen) citrate	C6H6Mg07	1
Caelo	Magnesium (hydrogen) citrate	13233901	10
Caelo	Magnesium (hydrogen) citrate	2368011	1
Caelo	Magnesium (hydrogen) citrate	11372907	1
Caelo	Magnesium (hydrogen) citrate	133233907	1
Caelo	Magnesium (hydrogen) citrate	315E-01829	1
Caelo	Magnesium (hydrogen) citrate	516Q-01829	1
Heide/Gehe	Magnesium (hydrogen) citrate	1077866	1
Euro OTC	Magnesium (hydrogen) citrate	1085730	2
Caelo	Magnesium (hydrogen) citrate	1311003-01	1
Caelo	Magnesium (hydrogen) citrate	13233906	10
Caelo	Magnesium (hydrogen) citrate	13389108	1
Caelo	Magnesium (hydrogen) citrate	13389106	3
Caelo	Magnesium (hydrogen) citrate	13389107	3
Caelo	Magnesium (hydrogen) citrate	13389110	1
Caelo	Magnesium (hydrogen) citrate	14265505	2
Caelo	Magnesium (hydrogen) citrate	14265511	1
Caelo	Magnesium (hydrogen) citrate	14265521	1
Caelo	Magnesium (hydrogen) citrate	14265513	2
Caelo	Magnesium (hydrogen) citrate	14I12-B02-298854	1
Euro OTC	Magnesium (hydrogen) citrate	1507010-02	2
Caelo	Magnesium (hydrogen) citrate	15296712	2
Caelo	Magnesium (hydrogen) citrate	15296802	1
Euro OTC	Magnesium (hydrogen) citrate	1601005-01	1
Caelo	Magnesium (hydrogen) citrate	17061401	1
Euro OTC	Magnesium (hydrogen) citrate	L15402018-01	1
Heidelberger/Noweda	Magnesium (hydrogen) citrate	1070876-2	1
Caelo	Magnesium (hydrogen) citrate	11044103	2
Caelo	Magnesium (hydrogen) citrate	11021401	1
Gehe/EuRho	Magnesium (hydrogen) citrate	1208006-2	1
Kehr	Magnesium (hydrogen) citrate	12080206-01	1
Caelo	Magnesium (hydrogen) citrate	12105421	1
Euro OTC	Magnesium (hydrogen) citrate	1211033-01	4
Anzag	Magnesium (hydrogen) citrate	12175802	1
Caelo	Magnesium (hydrogen) citrate	12238001	3
Caelo	Magnesium (hydrogen) citrate	12238004	3
Caelo	Magnesium (hydrogen) citrate	12238003	1
Maros/Phönix	Magnesium (hydrogen) citrate	12238004	2
Caelo	Magnesium (hydrogen) citrate	12368002	5
Caelo	Magnesium (hydrogen) citrate	12368005	3
Caelo	Magnesium (hydrogen) citrate	12368011	7
Caelo	Magnesium (hydrogen) citrate	12368014	1
Caelo	Magnesium (hydrogen) citrate	12368014	2
Fagron	Magnesium (hydrogen) citrate	12h28-n03	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Magnesium (hydrogen) citrate	12H28-N03	1
Euro OTC	Magnesium (hydrogen) citrate	1306034-01	2
Caelo	Magnesium (hydrogen) citrate	13194601	5
Caelo	Magnesium (hydrogen) citrate	13233904	5
Caelo	Magnesium (hydrogen) citrate	13233907	2
Caelo	Magnesium (hydrogen) citrate	13233911	4
Caelo	Magnesium (hydrogen) citrate	13389103	8
Caelo	Magnesium (hydrogen) citrate	27111306	1
Caelo	Magnesium (hydrogen) citrate	80446188	1
Caelo	Magnesium (hydrogen) citrate	11061403	1
EuRho/Phönix	Magnesium (hydrogen) citrate	1311003-01	1
Phoenix 15.10.14	Magnesium (hydrogen) citrate	1311003-01	1
Euro OTC	Magnesium (hydrogen) citrate	1311003-02	1
Caelo	Magnesium (hydrogen) citrate	133389111	1
Caelo	Magnesium (hydrogen) citrate	13389102	2
AHD	Magnesium (hydrogen) citrate	13389103	1
Sanacaorp	Magnesium (hydrogen) citrate	13389108	1
Fagron	Magnesium (hydrogen) citrate		1
Fagron	Magnesium (hydrogen) citrate	13K11-B02-288161	1
Gehe Kassel	Magnesium (hydrogen) citrate	14/12-B02-298854	1
Euro OTC	Magnesium (hydrogen) citrate	1404023-01	5
Ichthyol/Phönix	Magnesium (hydrogen) citrate	14/12-B02-298854	1
Euro OTC	Magnesium (hydrogen) citrate	140704801	1
Caelo	Magnesium (hydrogen) citrate	14265504	3
Caelo	Magnesium (hydrogen) citrate	14265514	1
Fagron	Magnesium (hydrogen) citrate	14I12-B02	1
Euro OTC	Magnesium (hydrogen) citrate	1501026-01	2
Euro/Gehe	Magnesium (hydrogen) citrate	1507010-02	2
Euro OTC	Magnesium (hydrogen) citrate	151003301	1
Caelo	Magnesium (hydrogen) citrate	15296702	2
Euro OTC	Magnesium (hydrogen) citrate	2114M1829	1
Caelo	Magnesium (hydrogen) citrate	6081301	1
Euro OTC	Magnesium (hydrogen) citrate	Ch1404023-01	1
Caelo	Magnesium (hydrogen) citrate	913M-01829	1
Noweda	Magnesium (hydrogen) citrate	10163306	1
Dr. Paul Lohmann	Magnesium (hydrogen) citrate	1078434	1
Fagron	Magnesium (hydrogen) citrate	1056239	1
Caelo	Magnesium (hydrogen) citrate	11193104	1
Euro OTC	Magnesium (hydrogen) citrate	1010003-01	1
Phoenix 19.03.13	Magnesium (hydrogen) citrate	1208006-01	1
Phönix	Magnesium (hydrogen) citrate	1211033-01	1
Caelo	Magnesium (hydrogen) citrate	121033-01	1
Post-Apotheke	Magnesium (hydrogen) citrate	1211033-01	1
Phönix 07.10.13	Magnesium (hydrogen) citrate	12368011	1
Caelo	Magnesium (hydrogen) citrate	12368017	1
Eu Rho	Magnesium (hydrogen) citrate	1306034-01	1
Euro OTC	Magnesium (hydrogen) citrate	130603402	1
	Magnesium (hydrogen) citrate	1311003-01	1
Caelo	Magnesium (hydrogen) citrate	13194603	1
Caelo	Magnesium (hydrogen) citrate	13233905	1
Fagron	Magnesium (hydrogen) citrate	13B22-N03	1
Fagron	Magnesium (hydrogen) citrate	13D30-N07	2
Fagron	Magnesium (hydrogen) citrate	13G02-N04	2
Caelo	Magnesium (hydrogen) citrate	16061203	1
Caelo	Magnesium (hydrogen) citrate	19061316	1
Euro OTC	Magnesium (hydrogen) citrate	140402301	1
Caelo	Magnesium (hydrogen) citrate	28131-01829	1
Caelo	Magnesium (hydrogen) citrate	90396169	1
Caelo	Magnesium (hydrogen) citrate	411052-2-P	1
Euro OTC	Magnesium (hydrogen) citrate	Ch1211033-02	3

- 55 634 spectra from 335 *Apo-Ident* customers from a total of 20 466 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium (hydrogen) citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium (hydrogen) citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	340	0	75 538
Type B	0	255	0	81 093
Type C	0	363	4	55 634

The substance/substance group *Magnesium (hydrogen) citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.2353 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.6471 %)
Type C	100.0000 % (> 99.8622 %)	98.9101 % (> 98.0926 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20016	20016	0.00	38.07
20595	22233	3.80	37.27
20599	20599	0.00	38.42
21445	22233	5.54	34.51
21873	21873	0.00	38.09
22233	22233	0.00	38.03
22296	22296	0.00	38.46
22992	22992	0.00	38.56

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium aspartate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21976-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium aspartate dihydrate; Magnesii aspartas dihydricus

Special notes

When selecting the *Magnesium aspartate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium aspartate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Magnesium aspart...	15I24-B89-313231	22343	40	AR-16-FG-008660-03
Fagron	Magnesium aspart...	15I24-B89-313231	22353	40	20151016

Validation samples

A total of 213 227 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 *Magnesium aspartate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Magnesium aspartate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Magnesium aspartate dihydrate	15I24-B89-313231	22343 [†]	20
Fagron	Magnesium aspartate dihydrate	15I24-B89-313231	22353 [†]	20

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Magnesium aspartate dihydrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium aspartate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium aspartate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Magnesium aspartate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22343	22343	0.00	38.43
22353	22343	1.72	38.37

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium citrate, anhydrous**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20616-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium citrate, anhydrous; Magnesii citras anhydricus; Magnesii citricum siccatum

Special notes

When selecting the *Magnesium citrate, anhydrous* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium citrate, anhydrous*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Magnesium citrat...	1501031	21794	40	AR-15-FG-007845-01
Euro OTC	Magnesium citrat...	1506020	21829	40	0000010379
Euro OTC	Magnesium citrat...	1507019	21860	40	0000010617
Euro OTC	Magnesium citrat...	1511018	22225	40	20151130*
Euro OTC	Magnesium citrat...	1602028	22505	40	20160314*

Validation samples

A total of 213 227 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 *Magnesium citrate, anhydrous*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 7 reference samples from the substance/substance group *Magnesium citrate, anhydrous*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Paul Lohmann	Magnesium citrate, anhydrous	1040331	20616	40
Euro OTC	Magnesium citrate, anhydrous	1501031	21794 [†]	20
Euro OTC	Magnesium citrate, anhydrous	1506020	21829 [†]	20
Euro OTC	Magnesium citrate, anhydrous	1507019	21860 [†]	20
Euro OTC	Magnesium citrate, anhydrous	1511018	22225 [†]	20
Euro OTC	Magnesium citrate, anhydrous	1607006	22673	40
Euro OTC	Magnesium citrate, anhydrous	1701018	22998	40

- 81 148 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 0 spectra from 0 *Apo-Ident* customers from 0 batches from the substance/substance group *Magnesium citrate, anhydrous*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium citrate, anhydrous* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium citrate, anhydrous* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	193	7	81 148
Type C	0	0	0	56 001

The substance/substance group *Magnesium citrate, anhydrous* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	96.5000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21794	21794	0.00	35.95
21829	21829	0.00	24.01
21860	21860	0.00	16.64
22225	22225	0.00	28.25
22505	22505	0.00	49.77

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium hydrogen aspartate tetrahydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20812-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium hydrogen aspartate tetrahydrate; Magnesii aspartas tetrahydricus; Magnesii asparticum tetrahydricum

Special notes

When selecting the *Magnesium hydrogen aspartate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Magnesium hydrog...	1204014-01	20812	40	1404588
Euro OTC	Magnesium hydrog...	1306045-01	21749	40	20130708
Euro OTC	Magnesium hydrog...	1605031	22682	40	20160617*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Magnesium hydrogen aspartate tetrahydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Magnesium hydrogen aspartate...	1012021-01	20384	40
Euro OTC	Magnesium hydrogen aspartate...	1012021-01	20441	40
Euro OTC	Magnesium hydrogen aspartate...	1012021	20614	40
Euro OTC	Magnesium hydrogen aspartate...	1306045-01	21749 [†]	20

- 81 208 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Magnesium hydrogen aspartate tetrahydrate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Magnesium hydrogen aspartate...	1504036-01	1
Euro OTC	Magnesium hydrogen aspartate...	1012021-01	1
Euro OTC	Magnesium hydrogen aspartate...	1204014-01	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium hydrogen aspartate tetrahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium hydrogen aspartate tetrahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	40	81 208
Type C	0	2	1	55 998

The substance/substance group *Magnesium hydrogen aspartate tetrahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	71.4286 % (> 69.2857 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20812	20812	0.00	42.08
21749	20812	4.13	41.90
22682	22682	0.00	42.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium orotate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20429-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium orotate dihydrate; Magnesii orotas; Magnesii oroticum

Special notes

When selecting the *Magnesium orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium orotate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Pharmorgana	Magnesium orotat...	1000135398	20429	40	AR-13-FG-003523-01
Euro OTC	Magnesium orotat...	1511021	22287	40	20151228*
Caelo	Magnesium orotat...	162227	22638	40	20160809*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Magnesium orotate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Magnesium orotate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Magnesium orotate dihydrate	1109034-01	20531	40
Euro OTC	Magnesium orotate dihydrate	1511021	22287 [†]	20
Euro OTC	Magnesium orotate dihydrate	1608017	22784	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 12 *Apo-Ident* customers from 15 batches from the substance/substance group *Magnesium orotate dihydrate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Magnesium orotate dihydrate	12G05-N03	1
Euro OTC	Magnesium orotate dihydrate	1305011-02	5
Fagron	Magnesium orotate dihydrate	14/13-B05-305616	1
Euro OTC	Magnesium orotate dihydrate	1407005-01	2
Fagron	Magnesium orotate dihydrate	14E20-B05-296005	1
Microsin Pharmorgana	Magnesium orotate dihydrate	OMR00213	1
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM02514	1
Euro OTC	Magnesium orotate dihydrate	8120	2
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM09114	1
Phoenix 22.03.13	Magnesium orotate dihydrate	1209029-01	1
Euro OTC	Magnesium orotate dihydrate	1209029-01	3
Fagron	Magnesium orotate dihydrate	1000060461	1
Euro OTC	Magnesium orotate dihydrate	1305011-01	1
Euro OTC	Magnesium orotate dihydrate	ORM00113	1
Microsin Pharmorgana	Magnesium orotate dihydrate	ORM00213	1
Fagron	Magnesium orotate dihydrate	13H06-N07	1

- 55 977 spectra from 335 *Apo-Ident* customers from a total of 20 597 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium orotate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium orotate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	60	40	81 248
Type C	0	23	1	55 977

The substance/substance group *Magnesium orotate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	60.0000 % (> 57.0000 %)
Type C	100.0000 % (> 99.8622 %)	95.8333 % (> 83.3333 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20429	20429	0.00	82.39
22287	22287	0.00	71.41
22638	22638	0.00	84.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Magnesium stearate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20707-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Magnesium stearate; Magnesii stearas; Magnesii stearinicum

Special notes

When selecting the *Magnesium stearate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Magnesium stearate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Magnesium stearate	12C29-N06	20707	110	20120418
Fagron	Magnesium stearate	12D26-B03	21084	40	1407310
Caelo	Magnesium stearate	13095536	21117	40	20130405
Caelo	Magnesium stearate	14136929	21783	40	AR-15-FG-012028-01
Euro OTC	Magnesium stearate	1502033-01	22817	40	20150317

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 5 reference samples from the substance/substance group *Magnesium stearate*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Magnesium stearate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Magnesium stearate	14136929	21783 [†]	20
Caelo	Magnesium stearate	162066	22763	40
Euro OTC	Magnesium stearate	1608022	22821	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Magnesium stearate*.

Supplier	Substance	Batch	Spectra
Caelo	Magnesium stearate	15155001	2
Euro OTC	Magnesium stearate	914I-01834	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
Noweda	Magnesium stearate	13D11-N08	1
Euro OTC	Magnesium stearate	315E-01834	1
Euro OTC	Magnesium stearate	1116E-01834	1
Caelo	Magnesium stearate	13095515	1
Euro OTC	Magnesium stearate	1912I-01834	1
Caelo	Magnesium stearate	13095536	1
Caelo	Magnesium stearate	12040307	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Magnesium stearate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Magnesium stearate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	100	0	81 248
Type C	0	8	2	55 991

The substance/substance group *Magnesium stearate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20707	21084	12.96	48.79
21084	21084	0.00	59.81
21117	21084	25.90	77.96
21783	21783	0.00	43.80
22817	21783	4.43	51.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Maltodextrin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20709-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Maltodextrin; Maltodextrinum

Special notes

When selecting the *Maltodextrin* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Maltodextrin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Berco	Maltodextrin	445-11	20709	40	1403228
Inresa	Maltodextrin	R1503902	21806	40	AR-15-FG-008821-01
Inresa	Maltodextrin	R1600014	22314	40	20160202

Validation samples

A total of 213 227 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 *Maltodextrin*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Maltodextrin*.

Supplier	Substance	Batch	Sample ID	Spectra
softline	Maltodextrin	940PLV-643	20442	40
Inresa	Maltodextrin	R1503902	21806 [†]	20
Inresa	Maltodextrin	R1600014	22314 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Maltodextrin*.

Supplier	Substance	Batch	Spectra
HBK Gesundheit	Maltodextrin	1143	4
HBK Gesundheit	Maltodextrin	2343	1
Berco	Maltodextrin	1os945-3	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*.

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Maltodextrin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Maltodextrin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 758
Type B	0	40	40	81 228
Type C	0	6	0	55 995

The substance/substance group *Maltodextrin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	50.0000 % (> 46.2500 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20709	20709	0.00	13.40
21806	21806	0.00	15.16
22314	21806	6.14	17.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Manganese orotate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22311-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Manganese orotate dihydrate

Special notes

When selecting the *Manganese orotate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Manganese orotate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Manganese orotat...	1601003	22311	40	20160113*
Euro OTC	Manganese orotat...	1605029-01	22654	40	20160624

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Manganese orotate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Manganese orotate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Manganese orotate dihydrate	1601003	22311 [†]	20
Euro OTC	Manganese orotate dihydrate	1605029-01	22737	40

- 81288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Manganese orotate dihydrate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Manganese orotate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Manganese orotate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	0	0	56 001

The substance/substance group *Manganese orotate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22311	22311	0.00	72.97
22654	22311	16.41	78.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Mannitole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20118-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mannitole; Mannitolium

Special notes

When selecting the *Mannitole* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mannitole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Mannitole	12305723	20980	40	1402329
Euro OTC	Mannitole	1508012	21884	40	20150827*
Euro OTC	Mannitole	1511025	22286	40	20151228*
Caelo	Mannitole	15197305	22581	40	20150720
Fagron	Mannitole	15A26-B01-305841	22883	40	20150204
Fagron	Mannitole	15A26-B01-305841	22884	40	20150204

Validation samples

A total of 213 227 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 *Mannitole*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 420 spectra of 11 reference samples from the substance/substance group *Mannitole*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mannitole	9204712	20118	40
Caelo	Mannitole	10100026	20130	40
Euro OTC	Mannitole	1508012	21884 [†]	20
Euro OTC	Mannitole	1511025	22286 [†]	20
Caelo	Mannitole	160140	22458	60
Euro OTC	Mannitole	1604008	22515	40
Caelo	Mannitole	16014013	22580	40
Caelo	Mannitole	162009	22614	40
Euro OTC	Mannitole	1606031	22697	40
Caelo	Mannitole	162121	22721	40
Euro OTC	Mannitole	1610027	22862	40

- 80 928 spectra from a total of 1936 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 695 spectra from 178 *Apo-Ident* customers from 196 batches from the substance/substance group *Mannitole*.

Supplier	Substance	Batch	Spectra
Caelo	Mannitole	13189227	11
Caelo	Mannitole	14051231	1
Caelo	Mannitole	14051209	6
Caelo	Mannitole	14323138	15
Caelo	Mannitole	15197313	5
Fagron	Mannitole	14G04-B07-296196	1
Caelo	Mannitole	12305709	20
Caelo	Mannitole	12305710	11
Phagron	Mannitole	1302C004-279405	1
Caelo	Mannitole	12305723	5
Caelo	Mannitole	1230578	1
Euro OTC	Mannitole	1305043-01	14
Caelo	Mannitole	16011402	1
Caelo	Mannitole	9204719	2
Klenk	Mannitole	5224A110314	1
Caelo	Mannitole	10100026	3
Euro OTC	Mannitole	1104028-01	1
Euro OTC	Mannitole	1110009-01	13
Caelo	Mannitole	11219114	3
Caelo	Mannitole	11003611	1
Caelo	Mannitole	10293140	1
Euro OTC	Mannitole	1110009-02	6
Noweda	Mannitole	11219101	2
Noweda	Mannitole	11219115	2
Caelo	Mannitole	11219121	1
Caelo	Mannitole	11219122	1
Noweda	Mannitole	11219124	1
Caelo	Mannitole	11219124	4
Noweda	Mannitole	11219138	1
Caelo	Mannitole	11308807	2
Euro OTC	Mannitole	1205016-01	16
Sino Phyto	Mannitole	12105403	1
Phönix	Mannitole	12051601	1
Phönix	Mannitole	120501602	1
Caelo	Mannitole	12105403	3
Noweda	Mannitole	12105404	1
Caelo	Mannitole	12105420	6
Caelo	Mannitole	12105404	4
Großhandel	Mannitole	12105420	1
Caelo	Mannitole	12105421	11
Noweda	Mannitole	12105405	1
Noweda	Mannitole	12105421	3
Caelo	Mannitole	12105433	11
cesar&lorenz/Phönix	Mannitole	12305710	1
Phönix	Mannitole	12305723	1
Caelo	Mannitole	12305724	3
Caelo	Mannitole	12305725	18
Caelo	Mannitole	12305726	1
Caelo	Mannitole	12305736	4
Caelo	Mannitole	12305734	2
Caelo	Mannitole	1305043-02	3
Caelo	Mannitole	12305740	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Mannitole	1310004-02	7
Euro OTC	Mannitole	1305043-02	12
Caelo	Mannitole	13189201	9
Caelo	Mannitole	13189203	10
Caelo	Mannitole	13189206	1
Caelo	Mannitole	13189215	16
Fagron	Mannitole	13K20-B01-287700	3
Alliance Health 12.08.2...	Mannitole	1404034-01	2
Caelo	Mannitole	14051215	8
Caelo	Mannitole	14051204	8
Caelo	Mannitole	14051205	7
Phönix	Mannitole	14051215	1
Euro OTC	Mannitole	1409016-01	9
Euro OTC	Mannitole	1409016-02	2
Caelo	Mannitole	14323103	3
Caelo	Mannitole	1423120	1
Caelo	Mannitole	14323105	3
Caelo	Mannitole	14323120	1
Caelo	Mannitole	14323115	3
Caelo	Mannitole	14323129	1
Fagron	Mannitole	14G04-B07	2
Euro OTC	Mannitole	1502022-01	8
Euro OTC	Mannitole	1511025-01	11
Euro OTC	Mannitole	1502022-02	5
Caelo	Mannitole	15184101	1
Fagron	Mannitole	15A26-B01-304717	1
Fagron	Mannitole	16824-B08-318962	1
Caelo	Mannitole	15K25-B04	1
xxxxx	Mannitole	xxxx	1
Caelo	Mannitole	20151012-2	1
Caelo	Mannitole	2101401	1
Euro OTC	Mannitole	17/14	1
Caelo	Mannitole	7071404	1
Caelo	Mannitole	2274635	1
Caelo	Mannitole	5031304	1
Caelo	Mannitole	9081303	1
Caelo	Mannitole	10011501	1
Euro OTC	Mannitole	1006019-01	1
stumpf	Mannitole	1104028-02	1
EuRho	Mannitole	1104028-03	1
Euro OTC	Mannitole	1104028-03	4
Euro OTC	Mannitole	1006019-02	1
Gehe	Mannitole	110009-02	1
Klenk	Mannitole	110402803	1
ANZAG am 11.05.2012	Mannitole	1104028-03	2
Caelo	Mannitole	1110009-02	1
Euro OTC	Mannitole	111100009-02	1
Fagron	Mannitole	11219122	1
Caelo	Mannitole	11219101	2
Euro OTC	Mannitole	1205016	1
Caelo	Mannitole	1205016-01	2
Fagron	Mannitole	11L19-N15	1
Caesar & Loretz GmbH, 4...	Mannitole	1205016-01	2
Gehe	Mannitole	1205016-01	1
phönix, 13.11.2012	Mannitole	1205016-01	2
EuRho	Mannitole	1205016-01	1
Caelo	Mannitole	1205016-02	2
Gehe/ Eurho	Mannitole	1205016-02	1
Anzag 25.02.13	Mannitole	1205016-02	1
Noweda	Mannitole	1205016-02	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Mannitole	1205016-02	3
Linden-Apotheke	Mannitole	1205016-02	1
Phoenix	Mannitole	120501602	1
Caelo	Mannitole	12105405	2
Euro OTC	Mannitole	1211034-01	7
gehe 14.08.2013	Mannitole	1211034	1
Caelo	Mannitole	12105438	1
Großhandel	Mannitole	12105438	3
Euro OTC	Mannitole	121103401	1
ANZAG	Mannitole	1211034-01	1
Caelo	Mannitole	1211034-01	1
Caelo	Mannitole	121103401	1
EuRho	Mannitole	1211034-01	1
Klenk	Mannitole	1211034-02	2
Euro OTC	Mannitole	1211034-02	17
Phönix	Mannitole	1211034-02	1
Caelo	Mannitole	1211034-02	1
Großhandel	Mannitole	12305710	1
Hirsch	Mannitole	12305725	1
Fagron	Mannitole	12E24-N03	1
Gehe	Mannitole	12E24-N08	1
Fagron	Mannitole	12E24-N08	1
Gehe	Mannitole	12J26-N15	1
Euro OTC	Mannitole	1305043	1
Euro OTC	Mannitole	130504301	1
gehe 10.12.13	Mannitole	1305043/01	1
Fagron	Mannitole	1302C004	2
Fagron	Mannitole	12K28-N01	1
Fagron	Mannitole	1302C005	1
Fagron	Mannitole	12J26-N15	2
Phönix	Mannitole	1305043-01	1
Noweda	Mannitole	1305043-01	1
GEHE	Mannitole	130504301	1
Euro OTC	Mannitole	131000401	1
Euro OTC	Mannitole	1310004-01	8
Phoenix	Mannitole	1310004-01	1
Caelo	Mannitole	1310004-01	4
PHOENIX 24.04.2014	Mannitole	1310004-01	3
Apomix	Mannitole	1310004-01	1
Sanacorp	Mannitole	1310004-01	1
GEHE 24.07.2014	Mannitole	1310004-02	1
Euro OTC	Mannitole	13155710	1
Caelo	Mannitole	13189207	7
Fagron	Mannitole	13189208	1
Caelo	Mannitole	13189208	5
Caesar & Loretz GmbH	Mannitole	13189207	1
Sanacorp	Mannitole	13189215	1
Caelo	Mannitole	13189226	2
Fagron	Mannitole	13B01-B05-283812	1
Caelo	Mannitole	13189228	1
Fagron	Mannitole	13B01-B05-287705	1
Gehe	Mannitole	13E24-N01	1
Fagron	Mannitole	13K20-B01	1
Fagron	Mannitole	13K20-B01-294193	1
Fagron	Mannitole	13E24N01	1
Fagron	Mannitole	13K20-B01-294194	2
Caelo	Mannitole	13K20-B01-287704	1
Euro OTC	Mannitole	14003402	1
Caelo	Mannitole	1400434-01	1
Euro OTC	Mannitole	1404034-01	18

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Mannitole	1404034-01	2
EuRhoPha	Mannitole	1404034-01	1
Euro OTC	Mannitole	140403401	1
Gehe	Mannitole	1404034-01	1
Euro OTC	Mannitole	1404034-02	12
Caelo	Mannitole	14051229	4
Caelo	Mannitole	14051216	2
Lamotte/Phoenix	Mannitole	1409016-01	1
Noweda29.04.2015	Mannitole	14323113	1
Caelo	Mannitole	14323113	1
Caelo	Mannitole	14323114	3
Caelo	Mannitole	14323121	6
Caesar & Loretz GmbH	Mannitole	14323119	1
Noweda	Mannitole	14323124	1
Caelo	Mannitole	14323124	1
Caelo	Mannitole	14323125	1
Caelo	Mannitole	14323126	3
Caelo	Mannitole	14323127	1
cealo/phoenix	Mannitole	14323138	2
Fagron	Mannitole	14G004-B07-301692	1
Noweda 08.032016	Mannitole	14323138	1
Euro OTC	Mannitole	15002022-01	1
Caelo	Mannitole	1502022-01	1
Fagron	Mannitole	14G17-B06-301921	1
Allianz Healthcare 26.0...	Mannitole	1502022-01	1
Euro OTC	Mannitole	150202201	2
Euro/Phönix	Mannitole	1502022-02	1
Euro OTC	Mannitole	150202202	1
Euro OTC	Mannitole	1508012-01	7
Caelo	Mannitole	1508012-01	2
Roquette Lestrem/Noweda	Mannitole	1508012-01	1
Euro OTC	Mannitole	1508012-02	5
Euro OTC	Mannitole	151025-01	1
Euro OTC	Mannitole	151102501	1
Roquette Lestrem/Noweda	Mannitole	1511025-01	1
Caelo	Mannitole	1519713	1
Caelo	Mannitole	15197301	1
Caelo	Mannitole	15197302	2
Caelo	Mannitole	15197303	1
Phoenix	Mannitole	15197314	1
Caelo	Mannitole	15197314	1
Caelo	Mannitole	15525	1
Fargon/ Noweda	Mannitole	15A26-B01-304717	1
Noweda	Mannitole	15B05-B06-304302	1
Fagron	Mannitole	15B05-B04-304084	2
Noweda	Mannitole	15I24-B05-314323	1
Fagron	Mannitole	15B05-B06-304302	1
Noweda	Mannitole	15I24-B05-314323	1
Caelo	Mannitole	15D28-B02-309192	1
Caelo	Mannitole	15B05-B09-304305	1
Fagron	Mannitole	15K25-B04-317786	1
Noweda	Mannitole	15K17-B01	1
Euro OTC	Mannitole	1604008-01	3
Defektur/eigen	Mannitole	1604008-01	1
Euro OTC	Mannitole	1606031-01	1
Caelo	Mannitole	16061401	1
Fargon/Sanacorp	Mannitole	16B24-B09-320013	1
Caelo	Mannitole	16212104	1
Caelo	Mannitole	2713M-01844	2
Caelo	Mannitole	24101306	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
PHÖNIX	Mannitole	16212102	1
Fagron	Mannitole	170980-0002	1
Caelo	Mannitole	16212103	1
EuRho	Mannitole	1911M-01844	1
Caelo	Mannitole	30121417	1
Caelo	Mannitole	4414E-01844	1
Caelo	Mannitole	30031502	1
Fagron	Mannitole	E616X	1
Caelo	Mannitole	48558	1
Fagron	Mannitole	E717A	1
Euro OTC	Mannitole	E671Z	1
Euro OTC	Mannitole	T03-07/1409016-01	1
Anzag	Mannitole	111000902	1
Fagron	Mannitole	1302C004-279405	1
Caelo	Mannitole	12305725-3444311112	1
Fagron	Mannitole	1302c005	1
Caelo	Mannitole	13095013	1
Gutenberg-Apotheke	Mannitole	1310004-01	4
Caelo	Mannitole	13189203-3566412081	1
Euro OTC	Mannitole	13189216	2
Gutenberg-Apotheke	Mannitole	13189221	1
Gutenberg-Apotheke	Mannitole	1310004-02	1
Caelo	Mannitole	13189222	3
Fagron	Mannitole	13B01-B05-283811	2
Fagron	Mannitole	13K20-B01-292064	2
Caelo	Mannitole	14051217	2
Caelo	Mannitole	14051208	2
Caelo	Mannitole	14051207	1
Caelo	Mannitole	14051224	2
Caelo	Mannitole	1405127	1
Caelo	Mannitole	14051230	2
Caelo	Mannitole	14323101	3
Fagron	Mannitole	15K17-B01-315560	1
Caelo	Mannitole	1612101	1
Fagron	Mannitole	E687X	1
Caelo	Mannitole	P154/14	1

- 55 306 spectra from 334 *Apo-Ident* customers from a total of 20 421 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mannitole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mannitole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 638
Type B	0	410	10	80 808
Type C	0	666	29	55 293

The substance/substance group *Mannitole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	97.6190 % (> 96.9048 %)
Type C	100.0000 % (> 99.8622 %)	95.8273 % (> 95.3957 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20980	20980	0.00	61.58
21884	21884	0.00	61.66
22286	22286	0.00	61.50
22581	22286	7.44	62.11
22883	20980	2.76	61.82
22884	20980	3.05	62.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Melatonin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20553-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Melatonin; Melatoninum

Special notes

When selecting the *Melatonin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Melatonin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Melatonin	11267102	20553	40	20111014
Caelo	Melatonin	12321404	20834	37	20121107
Caelo	Melatonin	12321411	20835	40	20121107
Caelo	Melatonin	12321415	20987	80	20121107
Euro OTC	Melatonin	1305029-02	21618	40	1411054
Euro OTC	Melatonin	1510041	22237	40	20151123*
Fagron	Melatonin	15G06-B03-315183	22892	40	20150717
Fagron	Melatonin	15G06-B03-323733	22893	40	20150717

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 357 spectra of 8 reference samples from the substance/substance group *Melatonin*. These samples are listed above in the [calibration samples](#) section.
- 75 521 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 340 spectra of 9 reference samples from the substance/substance group *Melatonin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Melatonin	9366205	20106	40
Euro OTC	Melatonin	1305029-02	21618 [†]	20
Euro OTC	Melatonin	1510041	22237 [†]	20
Euro OTC	Melatonin	1610040	22871	40
Caelo	Melatonin	163437	23036	40
Euro OTC	Melatonin	1510041	22237SI	60
Fagron	Melatonin	15G06-B03-315183	22892SI	40
Fagron	Melatonin	15G06-B03-323733	22893SI	40
Caelo	Melatonin	163437	23036SI	40

- 81 008 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 226 spectra from 65 *Apo-Ident* customers from 102 batches from the substance/substance group *Melatonin*.

Supplier	Substance	Batch	Spectra
Caelo	Melatonin	10071303	1
Cealo/Gehe	Melatonin	10296624	1
Gehe	Melatonin	11/26-N07	1
Caelo	Melatonin	10296623	1
Inresa	Melatonin	110005	1
ANZAG am 30.04.2012	Melatonin	11267102	1
Noweda	Melatonin	11267102	2
Caelo	Melatonin	11267108	1
Caelo	Melatonin	11267109	4
Phönix, 31.10.2012	Melatonin	11267109	1
Phönix Gotha	Melatonin	11267110	2
Caelo	Melatonin	11267110	1
Noweda	Melatonin	11267111	1
Caelo	Melatonin	11267111	1
Caelo	Melatonin	11267114	1
Anzag 20.12.12	Melatonin	11267114	2
Caelo	Melatonin	11267119	1
Noweda	Melatonin	11267119	1
Sanacorp	Melatonin	11267119	1
Caelo	Melatonin	11267120	4
Phönix Gotha	Melatonin	11267120	1
Caelo	Melatonin	11267121	4
Noweda	Melatonin	11267126	1
Caelo	Melatonin	11267122	2
Gehe 10.04.2013	Melatonin	11267121	1
Caelo	Melatonin	11267126	3
Fagron	Melatonin	11F09-N02	1
Gehe	Melatonin	11L21-N04	1
Caelo	Melatonin	120009	1
Euro OTC	Melatonin	120008	1
Euro OTC	Melatonin	12001	2
Euro OTC	Melatonin	1204003-02	14
Anzag 10.08.2012	Melatonin	1204003-01	1
	Melatonin	1204003-02	2
Euro OTC	Melatonin	120400302	1
Phönix 02.01.2014	Melatonin	1204003-02	1
10 17.07.2013	Melatonin	1231415	1
Caelo	Melatonin	12321404	3
Caelo	Melatonin	12321406	6
Caelo	Melatonin	12321415	3
Gehe am 20.03.2013	Melatonin	12321406	1
Caelo	Melatonin	12321411	2
gehe 12.09.13	Melatonin	12321415	1
Caelo	Melatonin	12321416	6
Caelo	Melatonin	12321421	2
Caelo	Melatonin	12321422	6
Caelo	Melatonin	1296630	1
Anzag 22.02.13	Melatonin	1267121	2
Cealo	Melatonin	12321422	1
Gehe	Melatonin	12G19-N03	2
Fgron	Melatonin	12G19-N03	1
Fagron	Melatonin	1305029-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phoenix 03.04.2014	Melatonin	12J19-N02	1
Fagron	Melatonin	12K13-N02	1
Euro OTC	Melatonin	1305029-01	10
Euro OTC	Melatonin	1305092-01	1
Caelo	Melatonin	13167301	10
Phönix 19.02.2014	Melatonin	13167301	2
gehe	Melatonin	13167301	1
GEHE 22.03.2014	Melatonin	13167302	1
Caelo	Melatonin	13167310	1
Caelo	Melatonin	13167302	1
Caelo	Melatonin	13167312	3
Caelo	Melatonin	13167314	4
Fagron	Melatonin	13D12-N10	2
Fagron	Melatonin	13D12N10	1
Gehe	Melatonin	13D12-N10	1
Fagron	Melatonin	13e22-n12	1
Fagron	Melatonin	13E22-N12	1
Gehe	Melatonin	13E22-N12	1
Fagron	Melatonin	13E22N12	1
Fagron	Melatonin	13H21-N06	3
PHOENIX 14.04.2014	Melatonin	13E22-N12	1
Phönix 02.01.15	Melatonin	13H21-N06	1
Fagron	Melatonin	13H21-N065x	1
Fagron	Melatonin	13H29-B03-291180	3
Fagron	Melatonin	13H29-B03	1
Koisser	Melatonin	140202	2
Euro OTC	Melatonin	1407028-01	1
Cactus Botanics	Melatonin	140610-C061	1
Euro OTC	Melatonin	1407028-02	2
Caelo	Melatonin	14110302	1
Caelo	Melatonin	14110308	3
Caelo	Melatonin	14110305	1
Caelo	Melatonin	14110303	1
Caelo	Melatonin	14110314	1
Caelo	Melatonin	14110316	1
Fagron	Melatonin	14G18-B01-297244	1
Caelo	Melatonin	150601	1
Fagron	Melatonin	14G18-B01-297245	1
Fagron	Melatonin	14G18-B01-297242	1
Caelo	Melatonin	15093001	2
Caelo	Melatonin	15093002	1
Caelo	Melatonin	15093008	1
Euro OTC	Melatonin	1510041-01	1
Caelo	Melatonin	15093010	1
Caelo	Melatonin	1514E-03554	1
Caelo	Melatonin	1524309	1
Caelo	Melatonin	15254305	1
Caelo	Melatonin	15254306	5
Caelo	Melatonin	15254307	1
Caelo	Melatonin	15254308	2
Caelo	Melatonin	15254313	1
Euro OTC	Melatonin	15254316	1
Caelo	Melatonin	15254319	2
Caelo	Melatonin	15254320	1
Caelo	Melatonin	15254324	2
Caelo	Melatonin	15254328	2
Caelo	Melatonin	15254331	1
Caelo	Melatonin	15254338	1
Phoenix	Melatonin	15C20-B01	1
Fagron	Melatonin	15C20-B01-308426	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Melatonin	15C20-B01-306078	2
Fagron	Melatonin	15C20-B01-308427	2
Caelo	Melatonin	16121303	1
Fagron	Melatonin	15C20-B01-306077	1
Fagron	Melatonin	15G06-B03-315183	1
Caelo	Melatonin	20021312	1
Caelo	Melatonin	20021505	1
Caelo	Melatonin	2313M03554	1
Farmalabor / Farmalabor	Melatonin	P1201556-000	1
Euro OTC	Melatonin	CH1305029-01	1
KS Pharma	Melatonin	XPS130428	1
Caelo	Melatonin	11267128	1
Caelo	Melatonin	14110313	1
Phönix	Melatonin	11267111	1
Fagron	Melatonin	120009	1
Caelo	Melatonin	12321403	1
Fagron	Melatonin	12G19-N03	1

- 55 775 spectra from 335 *Apo-Ident* customers from a total of 20 509 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Melatonin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Melatonin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	357	0	75 521
Type B	0	340	0	81 008
Type C	0	208	18	55 775

The substance/substance group *Melatonin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.3193 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.2353 %)
Type C	100.0000 % (> 99.8622 %)	92.0354 % (> 90.7080 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20553	22237	7.13	42.02
20834	22237	23.31	45.88
20835	22237	4.41	38.85
20987	21618	2.76	38.33
21618	21618	0.00	38.37
22237	22237	0.00	38.53
22892	22237	3.47	37.98
22893	22237	4.81	37.57

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Menthol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20036-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Menthol; Levomentholum; Mentholum

Special notes

When selecting the *Menthol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Menthol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Menthol	13377404	21443	40	20131212
Euro OTC	Menthol	1403022-02	21601	30	20140408
Euro OTC	Menthol	1509045	21932	40	20151008*
Euro OTC	Menthol	1603024	22657	40	20160429*
Euro OTC	Menthol	1608012	22825	40	20160902*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Menthol*. These samples are listed above in the [calibration samples](#) section.
- 75 688 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 260 spectra of 8 reference samples from the substance/substance group *Menthol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Menthol	82621209	20036	30
Caelo	Menthol	82621429	20078	20
Caelo	Menthol	10157605	20273	40
Caelo	Menthol	13377404	21443 [†]	20
Euro OTC	Menthol	1403022-02	21601 [†]	30
Euro OTC	Menthol	1509045	21932 [†]	20
Caelo	Menthol	160956	22452	60
Euro OTC	Menthol	1701014	23005	40

- 81 088 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 409 spectra from 192 *Apo-Ident* customers from 141 batches from the substance/substance group *Menthol*.

Supplier	Substance	Batch	Spectra
Andreas Imhof	Menthol	8052015	1
Fagron	Menthol	13J21-N04	1
Euro OTC	Menthol	1410004-02	5
Caelo	Menthol	14183004	8
Caelo	Menthol	14183006	1
Fagron	Menthol	14H29-M02	8
Caelo	Menthol	15076101	5
Euro OTC	Menthol	1502006-02	8
Fagron	Menthol	858607	1
Caelo	Menthol	15363803	1
Caelo	Menthol	15076113	1
Caelo	Menthol	15076112	7
Fagron	Menthol	12/19-N10	2
Euro OTC	Menthol	1204036-01	10
Euro OTC	Menthol	1210017-01	5
Fagron	Menthol	12C05-N03	2
Imhof	Menthol	15-5401	1
Caelo	Menthol	314Q01855	1
Caelo	Menthol	13103901	24
Euro OTC	Menthol	120403602	3
Caelo	Menthol	750137	1
Fagron	Menthol	13D16-N09	7
Fagron	Menthol	750137	1
Noweda	Menthol	12020403	2
Anzag	Menthol	12/19-N10	1
Euro OTC	Menthol	120403601	1
Fagron	Menthol	12F01-N14	1
Caelo	Menthol	1320260	2
Caelo	Menthol	7111201	1
Caelo	Menthol	9221710	1
Caelo	Menthol	930716	1
Caelo	Menthol	515M-01855	1
Caelo	Menthol	1/AD1	1
Finze	Menthol	9221710	1
Euro OTC	Menthol	1002019-03	1
Euro OTC	Menthol	1008029-01	1
Caelo	Menthol	10157615	1
Euro OTC	Menthol	1105028-01	1
Caelo	Menthol	1111020-01	4
Caelo	Menthol	11091405	1
Euro OTC	Menthol	1111020-01	1
Caelo	Menthol	11202901	2
Euro OTC	Menthol	1111020-02	1
Caelo	Menthol	11202910	6
Caelo	Menthol	11202907	1
Caesar & Loretz GmbH, 4...	Menthol	11202910	1
Caelo	Menthol	11202912	2
Gehe/ 27.10.12 EuRho	Menthol	11219216	1
Caelo	Menthol	12020402	6
Caesar & Loretz GmbH, 4...	Menthol	12020402	1
Caelo	Menthol	12020403	1
Großhandel	Menthol	12020403	1
Caelo	Menthol	12020408	1
Caelo	Menthol	1202041	1
Caesar/Noweda	Menthol	12020403	1
Caelo	Menthol	12020410	1
Caelo	Menthol	12020411	7

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Menthol	12020411	1
Gehe	Menthol	12020411	1
Caesar & Loretz GmbH, 4...	Menthol	12020411	1
Gehe	Menthol	1204036-01	1
Euro OTC	Menthol	1204036-02	2
Caelo	Menthol	1204036-01	1
Noweda	Menthol	1204036-01	1
Euro OTC	Menthol	120-4036-02	2
EuRho	Menthol	1204036-02	1
euRho	Menthol	1204036-02	1
Euro OTC	Menthol	1204036-1	1
Sanacorp	Menthol	1210017-01	1
Euro OTC	Menthol	1210017-02	8
Phönix	Menthol	12246204	1
Fagron	Menthol	1219-N10	1
Caelo	Menthol	12246205	10
Anzag 03.05.2013	Menthol	12246205	1
Caelo	Menthol	12246204	1
Caelo	Menthol	12246211	3
v.d.l	Menthol		1
FARGON	Menthol	12c05-n03	1
Fagron	Menthol	12D23-N06	4
Fagron	Menthol	12Cos-N03	1
Phoenix 15.04.2014	Menthol	12246211	1
Caesar/Noweda	Menthol	12246211	1
Fagron	Menthol	12G20-N02	4
Fagron	Menthol	12I19-N10	2
AHD	Menthol	1305010-01	1
Euro OTC	Menthol	1305010-01	7
Caelo	Menthol	130501001	1
Euro OTC	Menthol	1305010-02	3
Alliance Health 14.04..14	Menthol	1305010-02	1
Retest	Menthol	1305010-02	1
Euro OTC	Menthol	130501002	1
Europharm	Menthol	130501-01	1
Caelo	Menthol	13103802	1
Caesar & Loretz GmbH, 4...	Menthol	13103901	1
Phönix 30.10.13	Menthol	13103901	1
Euro OTC	Menthol	1310J-01855	1
Caelo	Menthol	13159104	3
Caelo	Menthol	13159105	18
Phönix	Menthol	13159105	1
Caelo	Menthol	13377402	3
Caelo	Menthol	13377404	9
Caelo	Menthol	13377407	3
Caelo	Menthol	13377408	4
Caelo	Menthol	13377409	7
Caelo	Menthol	13377412	3
Gehe	Menthol	13377412	1
Caelo	Menthol	13377413	1
Gehe	Menthol	13D16-N09	1
Fagron	Menthol	13G09-N09	1
Fagron	Menthol	13D16-N090631/1300	1
Euro OTC	Menthol	1403022-01	2
Caelo	Menthol	13D16-N09	1
Fagron	Menthol	13G09-N090204/520	1
Fagron	Menthol	13016-N09	1
Euro OTC	Menthol	140302201	1
Phoenix	Menthol	1403022-02	1
Euro OTC	Menthol	1403022-02	8

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Menthol	1410004-01	10
Caelo	Menthol	1410004-01	1
Euro OTC	Menthol	140322-01	1
Euro OTC	Menthol	14030222-02	1
Phönix Gotha	Menthol	1410004-01	1
Euro OTC	Menthol	141000401	1
Caelo	Menthol	1410004-02	1
Caelo	Menthol	14183008	3
Caelo	Menthol	14183012	2
Caelo	Menthol	14183014	4
Caelo	Menthol	14183020	1
Caelo	Menthol	14183017	2
Fagron	Menthol	14H29-M04	1
Euro OTC	Menthol	1502006-01	6
Euro OTC	Menthol	150200601	1
Fagron	Menthol	15076101	1
Caelo	Menthol	15076106	5
Caesar&Loretz,Phönix	Menthol	15076106	1
Caelo	Menthol	15076115	1
Euro OTC	Menthol	1509045-03	3
Frey & Lau GmbH/Noweda	Menthol	1509045-03	2
Euro OTC	Menthol	1509045-02	1
Euro OTC	Menthol	1509045	2
Fagron	Menthol	1509045-03	1
Caelo	Menthol	15076215	1
Euro OTC	Menthol	150904502	1
Norex Flavours Pvt. Ltd...	Menthol	15286207	1
Norex Flavours Pvt. Ltd...	Menthol	15286205	1
Caelo	Menthol	15363809	1
Caelo	Menthol	15363810	1
Caelo	Menthol	15363805	2
Euro OTC	Menthol	1603021-01	1
Noweda	Menthol	15363809	1
Caelo	Menthol	15363804	2
Euro OTC	Menthol	1603024-01	1
Euro OTC	Menthol	1608012-12	1
Caelo	Menthol	1603024-01	1
Euro OTC	Menthol	1608012-01	1
Gehe	Menthol	16095602	1
Fagron	Menthol	1616Q-01855	1
Euro OTC	Menthol	290601901	1
Caelo	Menthol	16095603	1
Caelo	Menthol	1704211855	1
Caelo	Menthol	19051401	1
Caelo	Menthol	25051301	1
Caelo	Menthol	25041402	1
Caelo	Menthol	20200712-2	1
Caelo	Menthol	3912A-01855	1
EuRho	Menthol	2910A-01855	1
Caelo	Menthol	29121103	1
Caelo	Menthol	4810A-01855	1
Euro OTC	Menthol	721123	2
Euro OTC	Menthol	696773	1
Fagron	Menthol	4611I-01855(NP)	1
Caelo	Menthol	5315I-01855	1
Caelo	Menthol	72173258	1
Sanacorp	Menthol	6/AKD3	1
Phoenix	Menthol	750137	1
Fagron	Menthol	778301	1
Euro OTC	Menthol	858607	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Menthol	Ch1204036-02	1
Euro OTC	Menthol	807862	1
Caelo	Menthol	IntCh311052	1
Caelo	Menthol	814A-01855	1
Caelo	Menthol	12246203	1
Frey+Lau GmbH, Gehe	Menthol	1305010-02	1
Fagron	Menthol	1410004-01	2
Sanacorp	Menthol	13103901	1
Caelo	Menthol	13159110	1
Caelo	Menthol	687711	1

- 55 592 spectra from 335 *Apo-Ident* customers from a total of 20 474 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Menthol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Menthol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	188	2	75 688
Type B	0	208	52	81 088
Type C	0	386	23	55 592

The substance/substance group *Menthol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	98.9474 % (> 97.3684 %)
Type B	100.0000 % (> 99.9853 %)	80.0000 % (> 78.8462 %)
Type C	100.0000 % (> 99.8622 %)	94.3765 % (> 93.6430 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21443	21932	2.39	101.89
21601	21932	2.95	101.92
21932	21932	0.00	99.14
22657	22657	0.00	97.64
22825	22825	0.00	96.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Mepivacaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20710-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mepivacaine hydrochloride; Mepivacaini hydrochloridum; Mepivacainum hydrochloricum

Special notes

When selecting the *Mepivacaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mepivacaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mepivacaine hydr...	12A20-N12	20710	40	1401555
Fagron	Mepivacaine hydr...	13L04-B07-297077	21672	40	AR-15-FG-007876-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Mepivacaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Mepivacaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Mepivacaine hydrochloride	13L04-B07-297077	21672 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Mepivacaine hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Mepivacaine hydrochloride	12E31-B40-305570	1
Caelo	Mepivacaine hydrochloride	13G05-N02	1
Fagron	Mepivacaine hydrochloride	13G05-N02	1
Fagron	Mepivacaine hydrochloride	12F20-N07	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*.

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mepivacaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mepivacaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	3	1	55 997

The substance/substance group *Mepivacaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20710	20710	0.00	18.01
21672	21672	0.00	19.79

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Mesalazine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21772-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mesalazine; Mesalazinum

Special notes

When selecting the *Mesalazine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mesalazine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Mesalazine	1206029-04	21772	40	AR-15-FG-011819-01
Euro OTC	Mesalazine	1206029-04	21887	40	20140923
Fagron	Mesalazine	15H13-B06-317177	22356	40	20150827
Euro OTC	Mesalazine	1602005	22518	40	20160218*
Euro OTC	Mesalazine	1602005-01	22925	40	20160218
Fagron	Mesalazine	16I28-B02-327679	22929	40	20161128

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Mesalazine*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 124 spectra of 5 reference samples from the substance/substance group *Mesalazine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Mesalazine	1206029-04	21772 [†]	20
Euro OTC	Mesalazine	1206029-04	21887 [†]	20
Fagron	Mesalazine	15H13-B06-317177	22356 [†]	20
Euro OTC	Mesalazine	1611019	22872	40
Fagron	Mesalazine	16I28-B02-327679	not required	24

- 81 224 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 1 spectra from 1 *Apo-Ident* customers from 1 batches from the substance/substance group *Mesalazine*.

Supplier	Substance	Batch	Spectra
Fagron	Mesalazine	16128-B02-327679	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mesalazine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mesalazine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	124	0	81 224
Type C	0	1	0	56 000

The substance/substance group *Mesalazine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.1613 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21772	21772	0.00	63.65
21887	21772	5.84	63.35
22356	22518	6.84	65.30
22518	22518	0.00	65.49
22925	22518	8.81	65.30
22929	22518	9.48	63.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Metamizol sodium monohydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22634-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Metamizol sodium monohydrate; Metamizolum natricum monohydricum

Special notes

When selecting the *Metamizol sodium monohydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Metamizol sodium monohydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Metamizol sodium...	161610	22634	40	20160714*
Caelo	Metamizol sodium...	15362816	22666	40	20151106

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Metamizol sodium monohydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Metamizol sodium monohydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Metamizol sodium monohydrate	15362815	22726	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Metamizol sodium monohydrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Metamizol sodium monohydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metamizol sodium monohydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Metamizol sodium monohydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22634	22634	0.00	50.26
22666	22634	14.72	44.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methacholine chloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20733-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methacholine chloride; Methacholinii chloridum; Methacholinium chloratum

Special notes

When selecting the *Methacholine chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methacholine chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methacholine chl...	12F01-N04	20733	60	1403251
Caelo	Methacholine chl...	13260303	21251	40	20130827
Caelo	Methacholine chl...	13260303	21592	40	20130827
Caelo	Methacholine chl...	162293	22635	40	20160815*
Caelo	Methacholine chl...	16229304	22661	40	20160815
Caelo	Methacholine chl...	16229301	22662	40	20160815
Fagron	Methacholine chl...	16L20-B01-329966	22976	40	20170123
Fagron	Methacholine chl...	16L20-B01-329968	22977	40	20170123

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 340 spectra of 8 reference samples from the substance/substance group *Methacholine chloride*. These samples are listed above in the [calibration samples](#) section.
- 75 538 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 540 spectra of 12 reference samples from the substance/substance group *Methacholine chloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methacholine chloride	13260302	21420	60
Caelo	Methacholine chloride	13260302	21590	60
Caelo	Methacholine chloride	13260303	21592 [†]	20
Caelo	Methacholine chloride	163299	23049	40
Caelo	Methacholine chloride	13260302	21420SI	60
Caelo	Methacholine chloride	13260303	21592SI	60
Caelo	Methacholine chloride	162293	22635SI	40
Caelo	Methacholine chloride	16229304	22661SI	40
Caelo	Methacholine chloride	16229301	22662SI	40
Fagron	Methacholine chloride	16L20-B01-329966	22976SI	40
Fagron	Methacholine chloride	16L20-B01-329968	22977SI	40
Caelo	Methacholine chloride	163299	23049SI	40

- 80 808 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 13 spectra from 5 *Apo-Ident* customers from 10 batches from the substance/substance group *Methacholine chloride*.

Supplier	Substance	Batch	Spectra
Fagron	Methacholine chloride	13/13-N03	2
Fagron	Methacholine chloride	10031504	1
Fagron	Methacholine chloride	14G30-B03-296210	1
Fagron	Methacholine chloride	135000B	2
Fagron	Methacholine chloride	14G30-B03-296211	1
Fagron	Methacholine chloride	24061503	1
Fagron	Methacholine chloride	15F10-B02-315831	1
Fagron	Methacholine chloride	15F10-B02-315523	1
Fagron	Methacholine chloride	312160	1
Fagron	Methacholine chloride	13G10-N05	2

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methacholine chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methacholine chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	340	0	75 538
Type B	0	539	1	80 808
Type C	0	13	0	55 988

The substance/substance group *Methacholine chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.2353 %)
Type B	100.0000 % (> 99.9853 %)	99.8148 % (> 99.2593 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20733	20733	0.00	19.32
21251	20733	5.97	17.18
21592	20733	6.63	15.99
22635	22635	0.00	19.94
22661	20733	8.34	18.36
22662	22635	9.26	19.05
22976	20733	4.70	18.36
22977	20733	7.41	17.79

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methionine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20971-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methionine; Methioninum

Special notes

When selecting the *Methionine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methionine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methionine	12K01-N03	20971	40	1402432
Euro OTC	Methionine	L1404041-01	21751	40	20140508
Fagron	Methionine	13L19-B36-295115	21786	40	20140108
Euro OTC	Methionine	1602012	22368	40	20160219*
Caelo	Methionine	15404102	22727	40	AR-17-FG-000285-02

Validation samples

A total of 213 227 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 *Methionine*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 5 reference samples from the substance/substance group *Methionine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Methionine	11H05-N01	20421	40
Euro OTC	Methionine	L1404041-01	21751 [†]	20
Fagron	Methionine	13L19-B36-295115	21786 [†]	20
Euro OTC	Methionine	1602012	22368 [†]	20
Euro OTC	Methionine	1609024	22787	40

- 81 208 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 3 *Apo-Ident* customers from 10 batches from the substance/substance group *Methionine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Methionine	14G31-B02-297517	1
Fagron	Methionine	13L19-B36	2
dr.behr	Methionine	WE14020068-02	1
Fagron	Methionine	8116020107	1
Fagron	Methionine	15A15-B08-307753	1
Euro OTC	Methionine	L1505001-01	1
Fagron	Methionine	13G09-N02	1
Fagron	Methionine	12K01-N03	2
Fagron	Methionine	12D27-N06	1
Fagron	Methionine	12G27-N01	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methionine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methionine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	140	0	81 208
Type C	0	12	0	55 989

The substance/substance group *Methionine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20971	20971	0.00	33.84
21751	22368	3.30	34.21
21786	22368	3.37	34.55
22368	22368	0.00	34.46
22727	22727	0.00	31.51

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methoxsalen**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20233-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methoxsalen; Methoxsalenum

Special notes

When selecting the *Methoxsalen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methoxsalen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Methoxsalen	2909040-02	20233	40	20091015
Fagron	Methoxsalen	11F21-N02	20543	40	1402480
Euro OTC	Methoxsalen	130604101	21555	40	20130805
Euro OTC	Methoxsalen	1506013	21862	40	20150706*

Validation samples

A total of 213 227 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 *Methoxsalen*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 214 spectra of 6 reference samples from the substance/substance group *Methoxsalen*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Methoxsalen	130604101	21555 [†]	20
Euro OTC	Methoxsalen	1506013	21862 [†]	20
Euro OTC	Methoxsalen	1608019	22785	40
Euro OTC	Methoxsalen	130604101	21555SI	55
Euro OTC	Methoxsalen	1506013	21862SI	45
Euro OTC	Methoxsalen	1608019	22785SI	34

- 81 134 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 92 spectra from 42 *Apo-Ident* customers from 46 batches from the substance/substance group *Methoxsalen*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Methoxsalen	1503009-01	5
Euro OTC	Methoxsalen	1506013-01	2
Caelo	Methoxsalen	11376420	1
Caelo	Methoxsalen	11376433	1
Audor Pharma	Methoxsalen	1203009M	1
Fagron	Methoxsalen	12E02-N05	2
PHOENIX 18.02.14	Methoxsalen	1306041-01	2
Euro OTC	Methoxsalen	1306041-01	2
Caelo	Methoxsalen	1409003-01	5
Euro OTC	Methoxsalen	1409003-01	3
Caelo	Methoxsalen	1409003-02	1
Euro OTC	Methoxsalen	140900302	1
Euro OTC	Methoxsalen	1409003-02	2
Fagron	Methoxsalen	14F06-B05-296500	1
Fagron	Methoxsalen	14f06-b05-296500	1
Fagron	Methoxsalen	14F06-B05-296501	2
Caelo	Methoxsalen	14F06-B05-296501	1
Fagron	Methoxsalen	14F06-B05-301978	1
Phoenix	Methoxsalen	14F06-B05-296502	1
Euro OTC	Methoxsalen	1503009-01	7
Euro OTC	Methoxsalen	150300901	1
Euroo	Methoxsalen	1503009-01	1
Euro OTC	Methoxsalen	1503009-02	3
Herbal Creations/Caesar...	Methoxsalen	15244203	1
Caelo	Methoxsalen	15244204	3
Euro OTC	Methoxsalen	1506013-02	1
Caelo	Methoxsalen	15244205	2
Herbal Creations/Caesar...	Methoxsalen	15244205	1
Caelo	Methoxsalen	15244209	1
Fagron	Methoxsalen	15F23-B03-318166	1
Herbal creations/Caesar...	Methoxsalen	15244212	1
Caelo	Methoxsalen	16/079/M	1
Audor Pharma	Methoxsalen	AP15244213M	2
Herbal creations/Caesar...	Methoxsalen	15244208	1
Sanacorp	Methoxsalen	1AKD6	1
Euro OTC	Methoxsalen	1104010-01	1
EuRho	Methoxsalen	1104010-01	1
Phönix 13.05.2013	Methoxsalen	11376401	2
Phönix/Maros	Methoxsalen	11376408	2
Caelo	Methoxsalen	11376413	1
Noweda	Methoxsalen	11D07-N16	2
Fagron	Methoxsalen	11f21-n02	1
Fagron	Methoxsalen	11F21-N02	1
Fagron	Methoxsalen	11D07-N16	1
Euro OTC	Methoxsalen	1203009-01	1
Say Phytoceut. Ltd	Methoxsalen	1209015-01	4
Euro OTC	Methoxsalen	1209015-01	3
Euro OTC	Methoxsalen	120901501	1
Fagron	Methoxsalen	13A10N06	1
Fagron	Methoxsalen	12G02-N14	1
Nachprüfung	Methoxsalen	4211Q-03262	1
Fagron	Methoxsalen	2111A-03262	1
Caelo	Methoxsalen	13c13-n06	1
Fagron	Methoxsalen		1
Fagron	Methoxsalen	MS01/13-14	1
Audor Pharma	Methoxsalen	AP1011024-01M	1

- 55 909 spectra from 335 *Apo-Ident* customers from a total of 20 565 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methoxsalen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methoxsalen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	129	85	81 134
Type C	0	92	0	55 909

The substance/substance group *Methoxsalen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	60.2804 % (> 58.8785 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 93.4783 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20233	21862	11.04	72.07
20543	20543	0.00	70.07
21555	21862	5.46	75.56
21862	21862	0.00	75.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methyl cellulose**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20705-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methyl cellulose; Hypromellose 4000; Hypromellosem E4M Prem; Methylcellulosum; Methylhydroxypropylcellulosum E4M Prem

Special notes

When selecting the *Methyl cellulose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methyl cellulose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methyl cellulose	12D02-N09	20705	40	1402447
Caelo	Hypromellose 4000	13155006	20919	40	1402056
Caelo	Hypromellose 4000	13155006	20931	40	20130529
Caelo	Methyl cellulose	13130115	21570	40	20130517
Caelo	Hypromellose 4000	14338801	21702	30	20141217
Caelo	Methyl cellulose	160602	22457	40	20160323*
Fagron	Hypromellose 4000	15G08-B14-314845	22609	40	20150727

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Methyl cellulose*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1570 batches from further 382 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Methyl cellulose*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Hypromellose 4000	11A27-N27	20222	40
Caelo	Methyl cellulose	10247609	20225	40
Caelo	Methyl cellulose	13130115	21570 [†]	20
Caelo	Hypromellose 4000	14338801	21702 [†]	15
Caelo	Methyl cellulose	160602	22457 [†]	20
Caelo	Hypromellose 4000	162244	22757	40

- 81 173 spectra from a total of 1941 batches from further 619 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 204 spectra from 108 *Apo-Ident* customers from 96 batches from the substance/substance group *Methyl cellulose*.

Supplier	Substance	Batch	Spectra
Euro OTC	Hypromellose 4000	1306022-02	1
Caelo	Hypromellose 4000	13155004	9
Caelo	Hypromellose 4000	14338802	1
Fagron	Hypromellose 4000	13D03-N03	7
Caelo	Hypromellose 4000	1438801	1
Fagron	Hypromellose 4000	13E02-B03-290531	3
Caelo	Hypromellose 4000	14338801	1
Fagron	Hypromellose 4000	13H09-N04	8
Fagron	Hypromellose 4000	14C05-B03-294708	6
Fagron	Hypromellose 4000	14C05B03	1
DOW Chemical Company Mi...	Hypromellose 4000	14G02-B11-296850	1
Fagron	Hypromellose 4000	14G02-B11-296850	1
Phönix Gotha	Hypromellose 4000	14G02-B11-296850	1
Fagron	Hypromellose 4000	14G02-B11-296851	1
Fagron	Hypromellose 4000	14G02-B11-302118	2
Fagron	Hypromellose 4000	15G08-B14-310845	4
Fagron	Hypromellose 4000	15B02-B05	1
Fagron	Hypromellose 4000	15B02-B05-308852	1
Fagron	Hypromellose 4000	16B16-B07-321327	1
Caelo	Hypromellose 4000	15B02-B05-308852	1
Fagron	Hypromellose 4000	15g08-b14-310845	1
Caelo	Hypromellose 4000	16224401	2
Fagron	Hypromellose 4000	700182-0001	1
Caelo	Hypromellose 4000	12098702	1
Fagron	Hypromellose 4000	1K01012N11	1
Kehr	Hypromellose 4000	12098704	1
Fagron	Hypromellose 4000	12A30-N02	3
Caelo	Hypromellose 4000	12215504	2
Caelo	Hypromellose 4000	13100304	3
Fagron	Hypromellose 4000	12E02-N03	2
Fagron	Hypromellose 4000	12G23-N03	2
Caelo	Hypromellose 4000	13155005	1
Noweda	Hypromellose 4000	1315505	1
Fagron	Hypromellose 4000	ZH19012N12	4
Fagron	Hypromellose 4000	1J31012N11	3
Fagron	Hypromellose 4000	13D03N03	1
Fagron	Hypromellose 4000	10G09-N03	1
Fagron	Hypromellose 4000	13E02-B03-290532	1
Caelo	Methyl cellulose	12L05-N03	1
Fagron	Methyl cellulose	13/26-N04	1
Fagron	Methyl cellulose	12H06-N06	2
Caelo	Methyl cellulose	5081404	1
Fagron	Methyl cellulose	131301(09)	1
Caelo	Methyl cellulose	13130104	4
Caelo	Methyl cellulose	13130109	4
Caelo	Methyl cellulose	13130115	6
Caelo	Methyl cellulose	13130121	2
Fagron	Methyl cellulose	13E02-B03-290531	1
Caelo	Methyl cellulose	14197514	6
Caelo	Methyl cellulose	14197513	1
Caelo	Methyl cellulose	14197502	2
Caelo	Methyl cellulose	15179602	7
Euro OTC	Methyl cellulose	15179602	1
Caelo	Methyl cellulose	15179605	7
Fagron	Methyl cellulose	15G08B14314845	1
Caelo	Methyl cellulose	16060210	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Methyl cellulose	13021401	1
Caelo	Methyl cellulose	12044931	2
Caelo	Methyl cellulose	20021401	1
Euro OTC	Methyl cellulose	10247609	1
Caelo	Methyl cellulose	10247604	1
Caelo	Methyl cellulose	13130102	1
Caelo	Methyl cellulose	11127303	1
Caelo	Methyl cellulose	11127314	1
Fagron	Methyl cellulose	11G15-N08	1
Caelo	Methyl cellulose	12044903	3
Caelo	Methyl cellulose	12044917	1
Caelo	Methyl cellulose	12044907	2
Caelo	Methyl cellulose	12044918	2
Caelo	Methyl cellulose	12044922	3
Caesar & Loretz GmbH	Methyl cellulose	12044922	1
Caelo	Methyl cellulose	12044927	5
Euro OTC	Methyl cellulose	12044927	1
Fagron	Hypromellose 4000	14G02-B11	2
Nachprüfung 2609	Hypromellose 4000	11H26-N01	1
Gehe	Hypromellose 4000	14G02-B11	1
Jenne	Hypromellose 4000	15G08-B14	1
Fagron	Hypromellose 4000	14G02-B11-302121	1
Fagron	Hypromellose 4000	15G08-B14-314845	3
Fagron	Hypromellose 4000	15G08B14314185	1
Phoenix	Hypromellose 4000	16B16-B07	1
Fagron	Hypromellose 4000	16B-16-B07-321327	1
Fagron	Hypromellose 4000	16B16-B07-318531	1
Fagron	Hypromellose 4000	16B16-B07-318276	1
Fagron	Hypromellose 4000	D180F8Q011	1
Gehe / 26.10.12 Fragon	Hypromellose 4000	9D30-N05	1
Gehe	Hypromellose 4000	11D15-N06	1
Anzag am 03.05.2012	Hypromellose 4000	11H26-N01	1
anzag, 21.11.2012	Hypromellose 4000	12E02-N03	3
Fagron	Hypromellose 4000	12D03-N03	1
Gehe	Hypromellose 4000	12E02-N03	1
Fagron	Hypromellose 4000	12G23-N03	1
Fagron	Hypromellose 4000	12H20-N05	1
Caelo	Hypromellose 4000	13155002	1
Caelo	Hypromellose 4000	13D03-N03	1
Caelo	Hypromellose 4000	13d03-n03	1
Alliance Health 27.12.2...	Hypromellose 4000	13D03-N03	1
Fagron	Hypromellose 4000	13h09-m04	1
Phoenix	Hypromellose 4000	13E02-B03	1
Phonix	Hypromellose 4000	13H09-N04	1
Gatt-Koller / Phoenix	Hypromellose 4000	14C05-B03-291647	2
Fagron	Hypromellose 4000	14C05-B03	1
Fagron	Hypromellose 4000	YI16012N11	1
Fagron	Hypromellose 4000	1A01012N11	1
Phoenix	Hypromellose 4000	14c05-b03-294708	1
Fagron	Hypromellose 4000	20110612-2	1
Fagron	Hypromellose 4000	13H08-N04	2
Fagron	Hypromellose 4000	14c05-B03-294708	1
Caelo	Hypromellose 4000	14C05-B03-294708	1
Fagron	Hypromellose 4000	14C05-B03-294711	1

- 55 797 spectra from 335 *Apo-Ident* customers from a total of 20 517 batches from a further 682 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methyl cellulose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methyl cellulose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	175	0	81 173
Type C	0	199	5	55 797

The substance/substance group *Methyl cellulose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.5714 %)
Type C	100.0000 % (> 99.8622 %)	97.5490 % (> 96.0784 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20705	20705	0.00	31.98
20919	20919	0.00	46.28
20931	20919	2.95	46.61
21570	20705	10.56	32.52
21702	20919	6.98	47.74
22457	22457	0.00	40.14
22609	20705	11.99	40.73

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methyl-4-hydroxybenzoate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20345-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methyl-4-hydroxybenzoate; Methylis parahydroxybenzoas; Methylum parahydroxybenzoicum

Special notes

When selecting the *Methyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Methyl-4-hydroxy...	09344712	20345	40	AR-12-FG-009589-01
Caelo	Methyl-4-hydroxy...	11090031	20505	40	AR-13-FG-002515-01
Caelo	Methyl-4-hydroxy...	11090034	20693	40	20110428
Euro OTC	Methyl-4-hydroxy...	1205025-01	20697	40	20120601
Euro OTC	Methyl-4-hydroxy...	1601037	22305	40	20160119*

Validation samples

A total of 213 227 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 *Methyl-4-hydroxybenzoate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Methyl-4-hydroxybenzoate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Methyl-4-hydroxybenzoate	10039706	20134	40
Caelo	Methyl-4-hydroxybenzoate	13268813	21439	60
Euro OTC	Methyl-4-hydroxybenzoate	1601037	22305 [†]	20

- 81 228 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 150 spectra from 88 *Apo-Ident* customers from 71 batches from the substance/substance group *Methyl-4-hydroxybenzoate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Methyl-4-hydroxybenzoate	13268809	8
Caelo	Methyl-4-hydroxybenzoate	6091402	1
Caelo	Methyl-4-hydroxybenzoate	13268804	6
Caelo	Methyl-4-hydroxybenzoate	13268802	2
Caelo	Methyl-4-hydroxybenzoate	11090031	5
Caelo	Methyl-4-hydroxybenzoate	12081502	1
Caelo	Methyl-4-hydroxybenzoate	12251624	7
Caelo	Methyl-4-hydroxybenzoate	13268803	1
Caesar & Loretz GmbH	Methyl-4-hydroxybenzoate	13268809	1
Caelo	Methyl-4-hydroxybenzoate	13268813	6
Euro OTC	Methyl-4-hydroxybenzoate	140600501	1
Euro OTC	Methyl-4-hydroxybenzoate	1401027-01	1
Caelo	Methyl-4-hydroxybenzoate	14120208	1
Euro OTC	Methyl-4-hydroxybenzoate	1401027-02	2
Caelo	Methyl-4-hydroxybenzoate	13268821	1
Euro OTC	Methyl-4-hydroxybenzoate	1502009-01	5
Caelo	Methyl-4-hydroxybenzoate	15063803	1
Caelo	Methyl-4-hydroxybenzoate	15063806	6
Caelo	Methyl-4-hydroxybenzoate	15298102	3
Euro OTC	Methyl-4-hydroxybenzoate	1507042-01	3
Caelo	Methyl-4-hydroxybenzoate	15222203	1
PHÖNIX	Methyl-4-hydroxybenzoate	15063819	1
Caelo	Methyl-4-hydroxybenzoate	413051/1	1
Euro OTC	Methyl-4-hydroxybenzoate	3115M-01930	1
Phönix	Methyl-4-hydroxybenzoate	2AKD3	1
Fagron	Methyl-4-hydroxybenzoate		1
Euro OTC	Methyl-4-hydroxybenzoate	4312I-01930	1
Eigenherstellung	Methyl-4-hydroxybenzoate	100912PML01	1
Caelo	Methyl-4-hydroxybenzoate	8121-01930	1
GATT-KOLLER/PHOENIX	Methyl-4-hydroxybenzoate	6112/01142814	1
Euro OTC	Methyl-4-hydroxybenzoate	4314U-01930	1
Caelo	Methyl-4-hydroxybenzoate	9011303	1
Caelo	Methyl-4-hydroxybenzoate	713Q-01930	1
Caelo	Methyl-4-hydroxybenzoate	10039706	1
Caelo	Methyl-4-hydroxybenzoate	10113609	1
Caelo	Methyl-4-hydroxybenzoate	1108211930	1
Caelo	Methyl-4-hydroxybenzoate	11090030	3
Caelo	Methyl-4-hydroxybenzoate	11090003	1
Caelo	Methyl-4-hydroxybenzoate	110900029	1
Gehe	Methyl-4-hydroxybenzoate	11090020	1
Gehe	Methyl-4-hydroxybenzoate	11090031	1
Euro OTC	Methyl-4-hydroxybenzoate	1110033-01	1
Caelo	Methyl-4-hydroxybenzoate	111003301	1
Noweda	Methyl-4-hydroxybenzoate	11345115	1
Post-Apotheke	Methyl-4-hydroxybenzoate	1110033-01	1
Anzag	Methyl-4-hydroxybenzoate	11345115	1
Caelo	Methyl-4-hydroxybenzoate	11345115	10
Caelo	Methyl-4-hydroxybenzoate	11345120	5
phönix,13.12.2012	Methyl-4-hydroxybenzoate	1205025-01	1
Euro OTC	Methyl-4-hydroxybenzoate	1212011-01	3
Bombastus	Methyl-4-hydroxybenzoate	1212011-01	1
Caelo	Methyl-4-hydroxybenzoate	12042202	1
Caelo	Methyl-4-hydroxybenzoate	12251605	5
Caelo	Methyl-4-hydroxybenzoate	12251611	1
AHD	Methyl-4-hydroxybenzoate	12251624	1
PHOENIX am 15.01.2014	Methyl-4-hydroxybenzoate	12251624	1
Phönix 14.01.2014	Methyl-4-hydroxybenzoate	12251624	1
Caelo	Methyl-4-hydroxybenzoate	1251624	1
Fagron	Methyl-4-hydroxybenzoate	12H02-N08	2
Fagron	Methyl-4-hydroxybenzoate	12D18-N01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Methyl-4-hydroxybenzoate	13081308	1
Anzag/	Methyl-4-hydroxybenzoate	201111251	1
Fagron	Methyl-4-hydroxybenzoate	13E27-N09	1
Fagron	Methyl-4-hydroxybenzoate	13B25-N03	2
Fagron	Methyl-4-hydroxybenzoate	20111125-1	1
Euro OTC	Methyl-4-hydroxybenzoate	172620	1
Caelo	Methyl-4-hydroxybenzoate	290114PML01	1
Euro OTC	Methyl-4-hydroxybenzoate	2606022	1
Caesar&lorenz,Phoenix	Methyl-4-hydroxybenzoate	13268821	1
Caelo	Methyl-4-hydroxybenzoate	14120210	1
Euro OTC	Methyl-4-hydroxybenzoate	120502501	1
Noweda	Methyl-4-hydroxybenzoate	21022111/1	1
Noweda	Methyl-4-hydroxybenzoate	11090002	2
Fagron	Methyl-4-hydroxybenzoate	12D18N01	1
Noweda	Methyl-4-hydroxybenzoate	11090021	1
Caelo	Methyl-4-hydroxybenzoate	13268815	1
Caelo	Methyl-4-hydroxybenzoate	12251619	2
Dorfmeister	Methyl-4-hydroxybenzoate	1212011-01	1
Caelo	Methyl-4-hydroxybenzoate	1225164	1
Noweda	Methyl-4-hydroxybenzoate	10113607	1
Noweda	Methyl-4-hydroxybenzoate	11090030	1
Noweda	Methyl-4-hydroxybenzoate	11090010	1
phönix 4.12.2013	Methyl-4-hydroxybenzoate	1212011/01	1

- 55 851 spectra from 335 *Apo-Ident* customers from a total of 20 542 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methyl-4-hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	110	10	81 228
Type C	0	147	3	55 851

The substance/substance group *Methyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	91.6667 % (> 89.1667 %)
Type C	100.0000 % (> 99.8622 %)	98.0000 % (> 96.0000 %)

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
20345	20345	0.00	41.63
20505	20505	0.00	41.89
20693	20345	4.93	43.36
20697	20345	4.21	43.13
22305	22305	0.00	43.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methylcobalamin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20743-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methylcobalamin

Special notes

When selecting the *Methylcobalamin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methylcobalamin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Methylcobalamin	1207019-01	20743	40	1402501
Euro OTC	Methylcobalamin	1401032-01	21721	40	8778
Euro OTC	Methylcobalamin	1510002	22234	40	20151201*
Euro OTC	Methylcobalamin	1401032	22239	40	20151201*
Euro OTC	Methylcobalamin	1601043	22379	40	20160209*

Validation samples

A total of 213 227 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 *Methylcobalamin*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Methylcobalamin*.

Supplier	Substance	Batch	Sample ID	Spectra
Hebei Welcome Pharmaceu...	Methylcobalamin	3090510	20438	40
Euro OTC	Methylcobalamin	1401032-01	21721 [†]	20
Euro OTC	Methylcobalamin	1510002	22234 [†]	20
Euro OTC	Methylcobalamin	1401032	22239 [†]	20
Euro OTC	Methylcobalamin	1601043	22379 [†]	20

- 81 228 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 4 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Methylcobalamin*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Methylcobalamin	1409017-01	1
Euro OTC	Methylcobalamin	1207019-01	1
Euro OTC	Methylcobalamin	1310014-01	1
Euro OTC	Methylcobalamin	Ch1207019-01	1

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methylcobalamin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methylcobalamin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	80	40	81 228
Type C	0	3	1	55 997

The substance/substance group *Methylcobalamin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	66.6667 % (> 64.1667 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20743	20743	0.00	29.74

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21721	21721	0.00	18.92
22234	22234	0.00	32.20
22239	22239	0.00	31.09
22379	22379	0.00	26.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methylprednisolone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20953-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methylprednisolone; Methylprednisolonum

Special notes

When selecting the *Methylprednisolone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methylprednisolone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methylprednisolone	13G19-N05	20953	40	1402438
Fagron	Methylprednisolone	15I04-B05-311572	22275	30	AR-16-FG-009102-01
Fagron	Methylprednisolone	15I04-B05-311572	22354	30	20151026
Fagron	Methylprednisolone	15I04-B05-311572	22275SI	30	AR-16-FG-009102-01
Fagron	Methylprednisolone	15I04-B05-311572	22354SI	30	20151026

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 5 reference samples from the substance/substance group *Methylprednisolone*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Methylprednisolone*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Methylprednisolone	12D17-N04	20650	40
Fagron	Methylprednisolone	15I04-B05-311572	22275 [†]	15
Fagron	Methylprednisolone	15I04-B05-311572	22354 [†]	15
Fagron	Methylprednisolone	15I04-B05-311572	22275SI [†]	15
Fagron	Methylprednisolone	15I04-B05-311572	22354SI [†]	15

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Methylprednisolone*.

[†]These spectra were recorded from 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
Fagron	Methylprednisolone	12D17-N04	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methylprednisolone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methylprednisolone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	100	0	81 248
Type C	0	1	0	56 000

The substance/substance group *Methylprednisolone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20953	20953	0.00	29.45
22275	22275	0.00	24.16
22354	22275	3.19	23.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Methylrosanilinium chloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20572-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Methylrosanilinium chloride; Methylrosanilini chloridum; Methylrosanilinium chloratum

Special notes

When selecting the *Methylrosanilinium chloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Methylrosanilinium chloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Methylrosanilini...	12D19-N01	20572	40	1402202
Caelo	Methylrosanilini...	12276308	20876	40	1509299
Fagron	Methylrosanilini...	13H28-N03	21536	40	20130625
Fagron	Methylrosanilini...	13H28-N03	21547	40	AR-15-FG-004742-01

Validation samples

A total of 213 227 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 *Methylrosanilinium chloride*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Methylrosanilinium chloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Methylrosanilinium chloride	10A11-N12	20115	40
Fagron	Methylrosanilinium chloride	12D19-N01	20560	40
Fagron	Methylrosanilinium chloride	13G03-N11	20916	40
Fagron	Methylrosanilinium chloride	13H28-N03	21536 [†]	20
Fagron	Methylrosanilinium chloride	13H28-N03	21547 [†]	20

- 81 188 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 53 spectra from 44 *Apo-Ident* customers from 25 batches from the substance/substance group *Methylrosanilinium chloride*.

[†]These spectra were recorded from 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
Noweda	Methylrosanilinium chloride	2159	1
Caelo	Methylrosanilinium chloride	13H28-N03	4
Fagron	Methylrosanilinium chloride	13H28-N03	16
Fagron	Methylrosanilinium chloride	12-17-N050109-140	1
Fagron	Methylrosanilinium chloride	13G03-N011	1
Fagron	Methylrosanilinium chloride	12D19-N01	3
Caelo	Methylrosanilinium chloride	13184801	1
Fagron	Methylrosanilinium chloride	2159	1
Fagron	Methylrosanilinium chloride	13H28-N03-0161-1030	1
Fagron	Methylrosanilinium chloride	13G03-N11	2
Phoenix, 03.09.2012	Methylrosanilinium chloride	12D19-N01	1
Fagron	Methylrosanilinium chloride	12D19-0005	1
Caelo	Methylrosanilinium chloride	12/17-N05	1
Fagron	Methylrosanilinium chloride	12I17-N05	2
Fagron	Methylrosanilinium chloride	12H28N06	1
Caelo	Methylrosanilinium chloride	12H28-N06	1
Fagron	Methylrosanilinium chloride	12H28-N06	1
Noweda	Methylrosanilinium chloride	12H28-N06	1
Caelo	Methylrosanilinium chloride	12H28-No6	1
Fagron	Methylrosanilinium chloride	13G03N11	1
Fagron	Methylrosanilinium chloride	13H28-N03	2
Macsen laboratories/Phö...	Methylrosanilinium chloride	1989	1
Caelo	Methylrosanilinium chloride	9238107	1
Caelo	Methylrosanilinium chloride	8088701	1
Caelo	Methylrosanilinium chloride	9238106	1
Caelo	Methylrosanilinium chloride	9238109	1
Anzag 28.08.2012	Methylrosanilinium chloride	9238107	1
Noweda	Methylrosanilinium chloride	9238104	1
GEHE	Methylrosanilinium chloride	928104	1
Noweda	Methylrosanilinium chloride	9238101	1

- 55 948 spectra from 335 *Apo-Ident* customers from a total of 20 586 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Methylrosanilinium chloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Methylrosanilinium - chloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	90	70	81 188
Type C	0	37	16	55 948

The substance/substance group *Methylrosanilinium chloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	56.2500 % (> 54.3750 %)
Type C	100.0000 % (> 99.8622 %)	69.8113 % (> 64.1509 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20572	20572	0.00	28.43
20876	20876	0.00	75.80
21536	21547	18.96	38.15
21547	21547	0.00	38.40

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Metoclopramide hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21662-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Metoclopramide hydrochloride; Metoclopramidi hydrochloridum

Special notes

When selecting the *Metoclopramide hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Metoclopramide hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Metoclopramide h...	14193102	21662	40	AR-15-FG-002889-01
Caelo	Metoclopramide h...	14193102	21746	40	20140725

Validation samples

A total of 213 227 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 *Metoclopramide hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Metoclopramide hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Metoclopramide hydrochloride	14193102	21662 [†]	20
Caelo	Metoclopramide hydrochloride	14193102	21746 [†]	20

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 11 *Apo-Ident* customers from 3 batches from the substance/substance group *Metoclopramide hydrochloride*.

Supplier	Substance	Batch	Spectra
Caesar&lorenz,Phoenix	Metoclopramide hydrochloride	14193101	1
Caelo	Metoclopramide hydrochloride	15227001	8

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Metoclopramide hydrochloride	14193101	1
Caelo	Metoclopramide hydrochloride	3414U-018969	1

- 55 990 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Metoclopramide hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metoclopramide hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	11	0	55 990

The substance/substance group *Metoclopramide hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21662	21662	0.00	66.84
21746	21662	4.06	69.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Metoprolol tartrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21753-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Metoprolol tartrate; Metoprololi tartras

Special notes

When selecting the *Metoprolol tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Metoprolol tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Inresa	Metoprolol tartr...	309905RII	21753	40	AR-15-FG-006635-01
Inresa	Metoprolol tartr...	405005RII	21805	40	20140430
Fagron	Metoprolol tartr...	16E31-B03-327107	22944	40	20160627

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Metoprolol tartrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 183 spectra of 6 reference samples from the substance/substance group *Metoprolol tartrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Inresa	Metoprolol tartrate	309905RII	21753 [†]	20
Inresa	Metoprolol tartrate	405005RII	21805 [†]	20
Inresa	Metoprolol tartrate	405005RIIC/29082016	22908	40
Fagron	Metoprolol tartrate	16E31-B03-327107	22927	40
Fagron	Metoprolol tartrate	16E31-B03-327107	22943	40
Fagron	Metoprolol tartrate	16E31-B03-327107	not required	23

- 81 165 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Metoprolol tartrate*.

[†]These spectra were recorded from 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
Antares	Metoprolol tartrate	1014Q-07308	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Metoprolol tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metoprolol tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	183	0	81 165
Type C	0	1	0	56 000

The substance/substance group *Metoprolol tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.7213 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21753	21753	0.00	38.00
21805	21753	2.69	37.37
22944	21753	11.36	36.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Metronidazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20001-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Metronidazole; Metronidazolum

Special notes

When selecting the *Metronidazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Metronidazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Metronidazole	81604189	20001	30	I 2009 000 269
Caelo	Metronidazole	12110410	20857	40	20120515
Fagron	Metronidazole	13D10-N02	21212	40	20130516
Euro OTC	Metronidazole	1212030-02	21213	40	20130627
Caelo	Metronidazole	13095007	21356	40	20130426
Caelo	Metronidazole	13095007	21360	40	20130426
Euro OTC	Metronidazole	1508004	21881	40	20150819*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Metronidazole*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 6 reference samples from the substance/substance group *Metronidazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Metronidazole	13095005	21214	40
Euro OTC	Metronidazole	1508004	21881 [†]	20
Caelo	Metronidazole	160892	22472	60
Euro OTC	Metronidazole	1609028	22751	40
Fagron	Metronidazole	16I19-B04-326155	22835	40
Euro OTC	Metronidazole	1612013	22917	40

- 81 108 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 1046 spectra from 247 *Apo-Ident* customers from 303 batches from the substance/substance group *Metronidazole*.

Supplier	Substance	Batch	Spectra
Euro OTC	Metronidazole	1307042-01	7
Fagron	Metronidazole	1220141155F	2
Caelo	Metronidazole	7031401	1
Caelo	Metronidazole	9715621	1
Caelo	Metronidazole	7071405	1
Euro OTC	Metronidazole	10800401	1
Caelo	Metronidazole	12081507	1
Caelo	Metronidazole	12091403	1
Euro OTC	Metronidazole	121001-02	3
Caelo	Metronidazole	113214021	1
Caelo	Metronidazole	11F15-N07	1
Euro OTC	Metronidazole	1212001-02	16
Gehe am 04.02.14	Metronidazole	1212030-01	2
Euro OTC	Metronidazole	1212030-02	5
Caelo	Metronidazole	1212030-21	1
Dorfmeister	Metronidazole	1212030-02	1
Caelo	Metronidazole	12339521	1
Fagron	Metronidazole	12L17-N16	3
Euro OTC	Metronidazole	1307002-01	6
Fagron	Metronidazole	12G04-N15	18
Fagron	Metronidazole	13/21-N07	2
GEHE 11.06.2014	Metronidazole	1307002-01	1
Euro OTC	Metronidazole	13070002-02	1
Fagron	Metronidazole	12f15-n04	1
Caelo	Metronidazole	13041503	1
Gehe	Metronidazole	1307002-01	1
Euro OTC	Metronidazole	1307002-02	1
Gehe	Metronidazole	1307002-02	1
Kuerzel	Metronidazole	1307002-02	1
EuRho/Phönix	Metronidazole	1307002-01	1
Fagron	Metronidazole	1307042	1
Alliance Health 20.05.2...	Metronidazole	1307042-01	2
Euro OTC	Metronidazole	1307042-02	7
Caelo	Metronidazole	13095002	8
Sanacorp	Metronidazole	13095002	1
Caelo	Metronidazole	13095003	12
Fagron	Metronidazole	13095002	1
Caelo	Metronidazole	13095004	10
Caelo	Metronidazole	13095005	7
Ichthyol Gesellschaft	Metronidazole	13095005	1
Caelo	Metronidazole	13095006	7
Caelo	Metronidazole	13095007	6
Caelo	Metronidazole	13095011	2
Caelo	Metronidazole	13095012	8
Caelo	Metronidazole	13095013	11
Noweda	Metronidazole	13095012	1
Caelo	Metronidazole	13095017	6
Caesar & Lorenz	Metronidazole	13095013	1
Caelo	Metronidazole	13095018	6
Caelo	Metronidazole	13095019	7
Caelo	Metronidazole	13095020	6
Caelo	Metronidazole	13214001	13
Caelo	Metronidazole	13214002	14
Caelo	Metronidazole	132140022	1
Caelo	Metronidazole	13214003	6
Caelo	Metronidazole	13214009	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	13214010	5
Caelo	Metronidazole	13214012	3
Caelo	Metronidazole	13214011	1
Caelo	Metronidazole	13214013	1
Caesar & Loretz GmbH Hi...	Metronidazole	13214013	1
Caelo	Metronidazole	13214014	4
Caelo	Metronidazole	13214015	6
Caelo	Metronidazole	13214016	1
Phönix	Metronidazole	13214017	1
Caelo	Metronidazole	13214017	1
Phönix Gotha	Metronidazole	13214017	1
Caelo	Metronidazole	13214018	4
Caelo	Metronidazole	13214019	6
Caelo	Metronidazole	13214021	1
Caelo	Metronidazole	13214024	3
Noweda	Metronidazole	13214025	1
Caelo	Metronidazole	13214029	6
Fagron	Metronidazole	13D10-N02	3
Anzag/Henry Lamotte	Metronidazole	13214029	1
Caelo	Metronidazole	1321409	1
Fagron	Metronidazole	13I10-N03	2
Fagron	Metronidazole	13J21-N07	29
Fagron	Metronidazole	13J21N07	3
Fagron	Metronidazole	13j21-n07	3
Fagron	Metronidazole	13j21-N07	1
Euro OTC	Metronidazole	1406010-01	13
EuRho	Metronidazole	1406010-01	1
Euro OTC	Metronidazole	140601001	2
Pphoenix goettin	Metronidazole	1406010-01	1
Euro OTC	Metronidazole	1407003	1
Euro OTC	Metronidazole	1407003-01	3
Euro OTC	Metronidazole	140700301	1
Euro OTC	Metronidazole	1407003-02	2
Euro OTC	Metronidazole	1412016-01	11
Euro OTC	Metronidazole	140700302	2
Caelo	Metronidazole	1412016-01	4
Euro OTC	Metronidazole	141201601	1
Euro OTC	Metronidazole	1412016-02	14
Fagron	Metronidazole	141C14-B02-296437	1
Farchemia Srl/Sanacorp	Metronidazole	146010-01	1
Fagron	Metronidazole	14B27-B31-291230	1
Fagron	Metronidazole	14B27-B31-291234	1
Fagron	Metronidazole	14B27-B31-291235	1
Fagron	Metronidazole	14C14-802-291237	1
Fagron	Metronidazole	14B-B02-291275	1
Fagron	Metronidazole	14C14-B01-306363	3
Fagron	Metronidazole	14C14-B01	1
Caelo	Metronidazole	14C14B02	3
Fagron	Metronidazole	14C14-B02-2911239	1
Fagron	Metronidazole	14C14-B02-291237	6
Fagron	Metronidazole	14c14-b02-21238	1
Caelo	Metronidazole	14C14-B02-291237	1
Fagron	Metronidazole	14C14-B02-291239	5
Fagron	Metronidazole	14C14-B02-291238	2
Fargon	Metronidazole	14c14-b02-291238	1
Fagron	Metronidazole	14c14-b02-291239	1
Caelo	Metronidazole	14C14-B02-291239	1
Fagron	Metronidazole	14C14-B02-291275	2
Fagron	Metronidazole	14c14-b02-291275	1
Fagron	Metronidazole	14c14b02291276	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Metronidazole	14C14-B02-291276	2
Fagron	Metronidazole	14C14-B02-291241	1
Caelo	Metronidazole	14C14-B02-291276	1
Fagron	Metronidazole	14C14-B02-295603	1
Fagron	Metronidazole	14C14-B02-296437	4
Fagron	Metronidazole	14-C14-B02-296437	1
Fagron	Metronidazole	14C14-B02-300182	2
Fagron	Metronidazole	14C14-B291237	1
Euro OTC	Metronidazole	1505024-01	5
Euro OTC	Metronidazole	1505024-02	2
Euro OTC	Metronidazole	1508004-01	12
Euro OTC	Metronidazole	1508004-02	2
Euro/ Sanacorp	Metronidazole	150800402	1
Euro OTC	Metronidazole	150804-01	1
Caelo	Metronidazole	15215103	1
Caelo	Metronidazole	15215104	3
Caelo	Metronidazole	15215105	2
Caelo	Metronidazole	15215107	1
Caelo	Metronidazole	15215108	6
Caelo	Metronidazole	15215106	2
Caelo	Metronidazole	1523013	1
Caelo	Metronidazole	1523026	1
Caelo	Metronidazole	15253001	4
Caelo	Metronidazole	15253002	1
Caelo	Metronidazole	15253003	5
Caesar&Loretz GmbH/Sana...	Metronidazole	15253003	1
Caelo	Metronidazole	15253004	4
Caelo	Metronidazole	15253005	1
Caelo	Metronidazole	15253006	3
Caelo	Metronidazole	15253007	4
	Metronidazole	15253007	2
Caelo	Metronidazole	15253011	5
Caelo	Metronidazole	15253013	5
Caelo	Metronidazole	15253015	5
Caelo	Metronidazole	15253016	5
Caesar & Loretz GmbH Hi...	Metronidazole	15253016	1
Caelo	Metronidazole	15253017	4
Caesar & Loretz GmbH	Metronidazole	15253017	1
Phönix	Metronidazole	15253018	1
Caelo	Metronidazole	15253018	3
Caelo	Metronidazole	15253020	4
Caelo	Metronidazole	15253021	1
Caelo	Metronidazole	15253019	1
Caelo	Metronidazole	15253024	3
Caelo	Metronidazole	15253026	5
Caelo	Metronidazole	15253027	3
Caelo	Metronidazole	15253028	1
Fagron	Metronidazole	15A20-B07	1
Caelo	Metronidazole	15253033	1
Farchemia S.R.L./ Caesa...	Metronidazole	15253032	1
Caelo	Metronidazole	15253029	1
Fagron	Metronidazole	15A20-B07-303293	3
Fagron	Metronidazole	15A20-B07-303294	1
Euro OTC	Metronidazole	15a20-b07-303294	1
Fagron	Metronidazole	15A20-B07-303295	1
Caelo	Metronidazole	15A20-B07-303297	1
Fischer/Gehe	Metronidazole	15A20-B07-308525	1
Fagron	Metronidazole	15A20-B07-308196	2
Fagron	Metronidazole	15A20-B07-303298	1
Fagron	Metronidazole	15A20B07308525	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Metronidazole	15A20-B07-308791	3
Fagron	Metronidazole	15a20-b07-308196	1
Fagron	Metronidazole	15a20-b07-308791	1
Fagron	Metronidazole	15A20-B07-312057	1
Fagron	Metronidazole	15A20-B07312057	1
Fagron	Metronidazole	15A20-B07-31225	1
Caelo	Metronidazole	16089209	2
Caelo	Metronidazole	16089213	1
Caelo	Metronidazole	16089216	1
Phoenix	Metronidazole	16089201	1
Euro OTC	Metronidazole	1609028-01	3
Caelo	Metronidazole	16089212	1
Caelo	Metronidazole	16089218	1
Euro/Sanacorp	Metronidazole	1609028	1
Fagron	Metronidazole	16I19-B04-326151	1
EURO / Sanacorp	Metronidazole	160902801	1
Euro OTC	Metronidazole	20120974	1
Fagron	Metronidazole	20130906F	4
Fagron	Metronidazole	172939-B01-295547	1
Caelo	Metronidazole	18071401	1
Fagron	Metronidazole	20140131F	1
Sanacorp	Metronidazole	39/AKD18	1
Caelo	Metronidazole	23011504	1
Caelo	Metronidazole	39/AKD4	1
Sanacorp	Metronidazole	39/AKD6	1
Sanacorp	Metronidazole		1
Caelo	Metronidazole	P145/14	1
Caelo	Metronidazole	102311870	1
Caelo	Metronidazole		1
Euro OTC	Metronidazole	1220150132	1
Caelo	Metronidazole	1210411	1
Caelo	Metronidazole	614U1870	1
Caelo	Metronidazole	2071304	1
Caelo	Metronidazole	607211870	1
Fagron	Metronidazole	9041303	1
Caelo	Metronidazole	9175609	1
Fagron	Metronidazole	8I10-N19	1
Euro OTC	Metronidazole	1003028-02	1
Caelo	Metronidazole	10112907	1
Caelo	Metronidazole	10368311	1
Caelo	Metronidazole	10368313	1
Caelo	Metronidazole	10368318	1
Gehe	Metronidazole	10368318	1
Caelo	Metronidazole	10368319	1
Fagron	Metronidazole	10F23-N05	1
Euro OTC	Metronidazole	1101017-03	1
Caelo	Metronidazole	10368320	1
Phönix 10.12.12	Metronidazole	1101017-03	2
Fargon	Metronidazole	1101017-01	1
Euro OTC	Metronidazole	1101017-3	1
Euro OTC	Metronidazole	1109016-01	4
ANZAG am 18.05.2012	Metronidazole	1109016-01	1
Euro OTC	Metronidazole	1109030-01	9
Post-Apotheke	Metronidazole	1109030-01	1
EuRho	Metronidazole	1109030-02	1
Euro OTC	Metronidazole	1109030-02	2
Post-Apotheke	Metronidazole	1109030-02	1
EuRho	Metronidazole	110903002	1
Euro OTC	Metronidazole	1109030-03	3
Anzag 09.07.2013	Metronidazole	1112028	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Metronidazole	1109030-03	1
Euro OTC	Metronidazole	1112028-01	5
Euro OTC	Metronidazole	1112028-02	7
Caelo	Metronidazole	1112028-02	2
Gehe	Metronidazole	1112028-02	1
Anzag 09.07.2013	Metronidazole	1112028-02	1
Gehe 08.06.2013	Metronidazole	111202802	1
Fagron	Metronidazole	112356	1
Caelo	Metronidazole	11319806	1
Caelo	Metronidazole	11319807	1
Kehr	Metronidazole	11319817	1
Caelo	Metronidazole	11319816	2
Caelo	Metronidazole	11319809	1
Caelo	Metronidazole	11319817	1
VDL	Metronidazole	11319816	1
Caelo	Metronidazole	11319812	1
Noweda	Metronidazole	11319818	2
Caelo	Metronidazole	11319818	4
Spangropharm	Metronidazole	11319818	1
Caelo	Metronidazole	11319824	3
Caelo	Metronidazole	11319819	1
Caelo	Metronidazole	11319823	6
Noweda	Metronidazole	11319824	1
Caelo	Metronidazole	11319825	6
Kehr	Metronidazole	11319825	1
Anzag	Metronidazole	11373512	1
Fagron	Metronidazole	11C21-N01	1
Fagron	Metronidazole	11F15-N07	1
Caelo	Metronidazole	11h11-n03	1
Fagron	Metronidazole	11H11-n03	1
Noweda	Metronidazole	11J07-N07	1
Caelo	Metronidazole	1201156	1
Fagron	Metronidazole	11J07-N07	1
Kehr	Metronidazole	1210411	1
Caelo	Metronidazole	12110105	1
Caelo	Metronidazole	12110121	1
Caelo	Metronidazole	12110403	1
Noweda	Metronidazole	12110404	1
Caelo	Metronidazole	12110405	9
Noweda	Metronidazole	12110405	1
Caelo	Metronidazole	121104085	1
Caesar&loretz,Phoenix	Metronidazole	12110410	1
Caelo	Metronidazole	12110410	2
Gehe	Metronidazole	12110410	1
Caelo	Metronidazole	12110411	8
Caelo	Metronidazole	12110412	8
Fargon	Metronidazole	12110412	1
Caelo	Metronidazole	12110413	6
Phönix Gotha	Metronidazole	12110413	1
Caelo	Metronidazole	12110414	3
Noweda	Metronidazole	12110415	1
Gehe	Metronidazole	12110415	1
Caelo	Metronidazole	12110415	4
Alliance Healthcare	Metronidazole	12110415	1
vdl	Metronidazole	12110421	1
Caelo	Metronidazole	12110421	9
Caelo	Metronidazole	12110422	19
Gehe	Metronidazole	12110422	1
Caelo	Metronidazole	12110423	2
Caelo	Metronidazole	1211413	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Metronidazole	121145	1
Euro OTC	Metronidazole	1212001-01	10
Phönix 08.11.2013	Metronidazole	1212001-02	1
Alliance Health 23.01.2...	Metronidazole	1212001-02	1
Euro OTC	Metronidazole	1212030-01	5
Caelo	Metronidazole	1212030-01	1
geh 30.08.13	Metronidazole	121203001	1
Phönix	Metronidazole	121203001	1
Caelo	Metronidazole	12339	1
Noweda	Metronidazole	12339501	1
Phoenix	Metronidazole	121203002	1
Caelo	Metronidazole	12339501	6
Caelo	Metronidazole	12339502	25
gehe 11.06.2013	Metronidazole	12339502	1
Alliance	Metronidazole	12339502	1
Caelo	Metronidazole	12339503	5
Caelo	Metronidazole	12339504	10
Caelo	Metronidazole	12339507	9
Phönix, 02.10.13	Metronidazole	12339508	1
Caelo	Metronidazole	12339508	5
Caelo	Metronidazole	12339509	4
Gehe	Metronidazole	12339509	1
Caelo	Metronidazole	12339510	14
Post-Apotheke	Metronidazole	12339510	1
Caelo	Metronidazole	12339511	13
Phönix/Maros	Metronidazole	12339511	1
Caesar&Loretz GmbH/Anzag	Metronidazole	12339511	1
Caelo	Metronidazole	12339519	11
Caelo	Metronidazole	12339520	5
Caesar & Loretz GmbH Hi...	Metronidazole	12339520	1
Caelo	Metronidazole	1239503	1
Caelo	Metronidazole	1239504	1
Fagron	Metronidazole	12D30-N03	4
Fagron	Metronidazole	12D30-N02	1
Fagron	Metronidazole	12F15-N04	9
Euro OTC	Metronidazole	12F15-N04	1
Fagron	Metronidazole	12g04-n15	1
Noweda	Metronidazole	12G04-N15	1
Sanacorp	Metronidazole	12G04-N15	1
A.H. 19.02.13 ek: 5,86EUR	Metronidazole	12G04-N15	1
Fagron	Metronidazole	12L17-N11	13
Fagron	Metronidazole	12L17N16	1
Fagron	Metronidazole	12L17N11	1
Erika apotheke	Metronidazole	12L17-N11	2
Caelo	Metronidazole	12L17-N11	1
Fagron	Metronidazole	12L17-n11	1
Phönix	Metronidazole	12L17-N11	1
Sanacorp	Metronidazole	12L17-N16	1
Fagron	Metronidazole	12L-N11	1
Euro OTC	Metronidazole	130704201	1
Euro OTC	Metronidazole	1308704201	1
Caelo	Metronidazole	13095001	11
gehe	Metronidazole	13095005	1
Caelo	Metronidazole	13B06-N023	1
Fagron	Metronidazole	13B06-N03	11
Caelo	Metronidazole	13B06-N03	2
Fagron	Metronidazole	13B06N03	1
Euro OTC	Metronidazole	13B06-N03	1
Fagron	Metronidazole	13D08-N22	7
Fagron	Metronidazole	13D08N22	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fargon	Metronidazole	13D08-N22	1
Fargron	Metronidazole	13D08-n22	1
Phönix	Metronidazole	13J21-N07	1
Caelo	Metronidazole	14111304	1
Fagron	Metronidazole	140700301	1
Euro OTC	Metronidazole	14120601	1
Caelo	Metronidazole	14B27-B31-291230	1
Euro OTC	Metronidazole	150502403	1
Caelo	Metronidazole	15121202	1
Phönix	Metronidazole	15253002	1
Caelo	Metronidazole	18051201	1
Fagron	Metronidazole	15A20-B07-308525	1
Fargron	Metronidazole	20121121	2
Euro OTC	Metronidazole	20111025	1
Caelo	Metronidazole	201007126	1
Caelo	Metronidazole	2013U-01870	2
Caelo	Metronidazole	20140612-12	1
Caelo	Metronidazole	2813E1870	1
Caelo	Metronidazole	28061204	1
Phoenix	Metronidazole		1
Caelo	Metronidazole	3112M-01870	1
Caelo	Metronidazole	30131-01870	1
Fagron	Metronidazole	3212E01870	1
Euro OTC	Metronidazole	700837	1
Sanacorp	Metronidazole	39AKD15	1
Caelo	Metronidazole	39/AKD16	1
Fagron	Metronidazole	Ch12L17-N11	1
Euro OTC	Metronidazole	F120017	1
Euro OTC	Metronidazole	110903002	1
Caelo	Metronidazole	10368310	1
Caelo	Metronidazole	MTZ/2050401	1
Caelo	Metronidazole	11319810	2
Caelo	Metronidazole	1112028-01	1
Caelo	Metronidazole	12339527	1
Fargron	Metronidazole	12a2o-n18	1

- 54955 spectra from 335 *Apo-Ident* customers from a total of 20313 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Metronidazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Metronidazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	240	0	81 108
Type C	0	1010	36	54 955

The substance/substance group *Metronidazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.5000 %)
Type C	100.0000 % (> 99.8622 %)	96.5583 % (> 96.2715 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20001	20001	0.00	56.89
20857	21881	13.79	59.91
21212	20001	18.31	58.83
21213	21881	17.30	58.74
21356	21881	9.78	58.45
21360	21881	4.67	57.75
21881	21881	0.00	56.70

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Miconazole nitrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20210-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Miconazole nitrate; Miconazoli nitras; Miconazolum nitricum

Special notes

When selecting the *Miconazole nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Miconazole nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Miconazole nitrate	10122908	20210	40	AR-12-FG-002993-01
Fagron	Miconazole nitrate	13D22-N14	20817	85	20130529
Caelo	Miconazole nitrate	13185601	20875	40	20130704
Caelo	Miconazole nitrate	13185601	20905	80	20130704
Caelo	Miconazole nitrate	13352802	21350	39	1412250
Euro OTC	Miconazole nitrate	1307025-02	21649	40	20130806
Euro OTC	Miconazole nitrate	1509014	21900	40	20150930*
Caelo	Miconazole nitrate	161447	22630	40	20160617*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 404 spectra of 8 reference samples from the substance/substance group *Miconazole nitrate*. These samples are listed above in the [calibration samples](#) section.
- 75 474 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 498 spectra of 14 reference samples from the substance/substance group *Miconazole nitrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Miconazole nitrate	13D22-N14	20817 [†]	5
Caelo	Miconazole nitrate	13352802	21351	40
Euro OTC	Miconazole nitrate	1307025-02	21649 [†]	20
Euro OTC	Miconazole nitrate	1509014	21900 [†]	20
Euro OTC	Miconazole nitrate	1604004	22522	40
Euro OTC	Miconazole nitrate	1607004	22671	40
Euro OTC	Miconazole nitrate	1611024	22920	40
Caelo	Miconazole nitrate	13185601	20875SI	60
Euro OTC	Miconazole nitrate	1307025-02	21649SI	37
Euro OTC	Miconazole nitrate	1509014	21900SI	53
Euro OTC	Miconazole nitrate	1604004	22522SI	36
Caelo	Miconazole nitrate	161447	22630SI	40
Euro OTC	Miconazole nitrate	1607004	22671SI	30
Euro OTC	Miconazole nitrate	1611024	22920SI	37

- 80 850 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 574 spectra from 147 *Apo-Ident* customers from 159 batches from the substance/substance group *Miconazole nitrate*.

Supplier	Substance	Batch	Spectra
Caelo	Miconazole nitrate	12374307	18
Euro OTC	Miconazole nitrate	1504003-01	1
Caelo	Miconazole nitrate	15137902	12
Fagron	Miconazole nitrate	15137905	1
Caelo	Miconazole nitrate	15137903	8
Caelo	Miconazole nitrate	15137913	1
Fagron	Miconazole nitrate	15a13-b07-308432	1
Fagron	Miconazole nitrate	15i08-b07-312317	1
Fagron	Miconazole nitrate	15i08-b07-315481	1
Caelo	Miconazole nitrate	16144704	1
Caelo	Miconazole nitrate	12243803	9
Anzag	Miconazole nitrate	12H10-N02	1
Anzag	Miconazole nitrate	12243801	1
Fagron	Miconazole nitrate	12h10-n02	1
Fagron	Miconazole nitrate	12K02-N06	5
Fagron	Miconazole nitrate	13H28-N06	18
Fagron	Miconazole nitrate	13061501	1
Gehe	Miconazole nitrate	14149301	1
Caelo	Miconazole nitrate	11104109	2
Caelo	Miconazole nitrate	13185609	6
Großhandel	Miconazole nitrate	13185610	2
Caelo	Miconazole nitrate	13185610	8
Phoenix	Miconazole nitrate	13185611	1
Caelo	Miconazole nitrate	13185612	5
Caelo	Miconazole nitrate	13352801	14
Caelo	Miconazole nitrate	13342801	1
Herbasinica	Miconazole nitrate	13352801	1
Caelo	Miconazole nitrate	13352802	14
Gehe am 29.04.2014	Miconazole nitrate	13352802	4
Caesar&Loretz GmbH/Anzag	Miconazole nitrate	13352802	1
Caelo	Miconazole nitrate	13352806	8
Caelo	Miconazole nitrate	13352805	1
Bombastus	Miconazole nitrate	13352806	1
Caelo	Miconazole nitrate	13352811	3
Fagron	Miconazole nitrate	13352811	2
Fagron	Miconazole nitrate	13A14-B09-287486	3
Fagron	Miconazole nitrate	13A14-B09-287488	2
Fagron	Miconazole nitrate	13A14-B09-287487	3
Gehe	Miconazole nitrate	13352811	1
Euro OTC	Miconazole nitrate	140902301	1
Caelo	Miconazole nitrate	14149301	10
Euro OTC	Miconazole nitrate	140902302	1
Fagron	Miconazole nitrate	14051403	1
Caesar & Loretz GmbH Hi...	Miconazole nitrate	14149301	1
Phoenix 21.10.14	Miconazole nitrate	14149301	1
Caelo	Miconazole nitrate	14149302	12
Caelo	Miconazole nitrate	14149303	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Miconazole nitrate	14149308	8
Caelo	Miconazole nitrate	14149305	1
Caelo	Miconazole nitrate	14149309	4
Caelo	Miconazole nitrate	14149310	7
Caesar&Loretz GmbH / Anzag	Miconazole nitrate	14149310	1
Caelo	Miconazole nitrate	14149311	10
GEHE 13.05	Miconazole nitrate	14149311	1
Noweda	Miconazole nitrate	14149311	1
Caelo	Miconazole nitrate	14149317	4
Fagron	Miconazole nitrate	14149313	1
EuroPTC/Phönix	Miconazole nitrate	14149316	1
Caelo	Miconazole nitrate	14149318	13
Caelo	Miconazole nitrate	1419301	1
Caelo	Miconazole nitrate	1419310	1
Fagron	Miconazole nitrate	14B18-B02-291249	1
Fagron	Miconazole nitrate	14B18-B02	5
Fagron	Miconazole nitrate	14B18B02	1
Fagron	Miconazole nitrate	14B18-B02-291232	3
Fagron	Miconazole nitrate	14B18-B02-291233	3
Fagron	Miconazole nitrate	14B18-B02-291248	6
Fagron	Miconazole nitrate	14D25-B06	2
Fagron	Miconazole nitrate	14D25-B06-294958	9
Fagron	Miconazole nitrate	14D25-B06-294959	5
Fagron	Miconazole nitrate	14D25-B06-294960	3
Fagron	Miconazole nitrate	14d25-b06-294960	1
Caelo	Miconazole nitrate	14D25-B06-294960	2
Fagron	Miconazole nitrate	14D25-B06-299790	1
Fagron	Miconazole nitrate	14d25-b06-299790	1
Fagron	Miconazole nitrate	14H06-B01-299799	4
Fagron	Miconazole nitrate	14H06-B01-299813	3
Caelo	Miconazole nitrate	15/08-B07-315481	1
Fagron	Miconazole nitrate		1
Fagron	Miconazole nitrate	15/08-B07-312317	1
Fagron	Miconazole nitrate	15/08-B07-318686	1
Euro OTC	Miconazole nitrate	1509014-01	2
EuRho	Miconazole nitrate	1504003-01	1
Noweda	Miconazole nitrate	15137903	1
Caelo	Miconazole nitrate	15137905	5
Caelo	Miconazole nitrate	15137907	2
Caelo	Miconazole nitrate	15137906	1
Caelo	Miconazole nitrate	15137908	1
Caelo	Miconazole nitrate	15137909	1
Caesar & Loretz/AHC	Miconazole nitrate	15137910	1
Caelo	Miconazole nitrate	15137911	1
Caelo	Miconazole nitrate	15137915	2
Phoenix	Miconazole nitrate	15137915	1
E+J, 27.09.2016	Miconazole nitrate	15137915	1
Fagron	Miconazole nitrate	15A13-B07	2
Fagron	Miconazole nitrate	15A13-B07-306565	1
Fagron	Miconazole nitrate	15A13-B07-306791	3
Fagron	Miconazole nitrate	15A13-B07-307140	3
Fagron	Miconazole nitrate	15A13-B07-308432	1
Fagron	Miconazole nitrate	15I08-B07-3121321	1
Caelo	Miconazole nitrate	15I08-B07-312317	4
Fagron	Miconazole nitrate	15I08-B07	1
Fagron	Miconazole nitrate	15I08-B07-312317	2
Fagron	Miconazole nitrate	15I08-B07-312321	2
Caelo	Miconazole nitrate	15I08-B07-315481	1
Fagron	Miconazole nitrate	15I08-B07-318686	1
Fagron	Miconazole nitrate	15I08-B07-315481	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Miconazole nitrate	15I08-B07-318686	1
Caelo	Miconazole nitrate	15I08-B07-314838	1
Caelo	Miconazole nitrate	15I08-B07-318686	1
Euro OTC	Miconazole nitrate	1604004-01	2
Fagron	Miconazole nitrate	15I08-B07-315492	1
Ichthyol/Phoenix	Miconazole nitrate	16/098/M	1
Caelo	Miconazole nitrate	16144701	3
Caelo	Miconazole nitrate	16144702	4
Caelo	Miconazole nitrate	16144703	2
Fagron	Miconazole nitrate	16E04-B03-321367	1
Fagron	Miconazole nitrate	16E04-B03-327362	1
Euro OTC	Miconazole nitrate	16E04-B03-322124	1
Fagron	Miconazole nitrate	19051402	1
Fagron	Miconazole nitrate	2900/04/14	2
Fagron	Miconazole nitrate	2900/15/13	1
Fagron	Miconazole nitrate	2900/16/14	2
Alliance H.	Miconazole nitrate	5137910	1
Caelo	Miconazole nitrate	8/AKD4	1
Caelo	Miconazole nitrate	4061304	1
Caelo	Miconazole nitrate	9177904	1
Fagron	Miconazole nitrate	4111301	1
Sanacorp	Miconazole nitrate		1
Caelo	Miconazole nitrate	11104103	2
Caelo	Miconazole nitrate	1/AD1	1
Caelo	Miconazole nitrate	11104108	1
Caelo	Miconazole nitrate	11104113	2
Caelo	Miconazole nitrate	11104114	1
Gehe	Miconazole nitrate	11104114	1
Caelo	Miconazole nitrate	11243803	1
Caelo	Miconazole nitrate	11324901	2
Herbasinica	Miconazole nitrate	11324901	1
Caelo	Miconazole nitrate	11324902	1
sanacorp	Miconazole nitrate	11324902	1
Caesar & Loretz GmbH, 4...	Miconazole nitrate	11324904	1
Caelo	Miconazole nitrate	11324905	5
Phoenix, 13.08.2012	Miconazole nitrate	11324905	1
Caelo	Miconazole nitrate	11324909	2
Caelo	Miconazole nitrate	11324912	2
Caelo	Miconazole nitrate	11324913	1
Anzag, 24.10.2012	Miconazole nitrate	11324913	1
Fagron	Miconazole nitrate	12/21-M03	1
Caelo	Miconazole nitrate	12243801	3
Caelo	Miconazole nitrate	12243802	4
Anzag	Miconazole nitrate	12243802	1
Großhandel	Miconazole nitrate	12243803	1
Sanacorp	Miconazole nitrate	12243803	2
Kehr	Miconazole nitrate	12243805	1
Caelo	Miconazole nitrate	12243805	5
Großhandel	Miconazole nitrate	12243806	1
Caesar und Loretz	Miconazole nitrate	12243805	1
Caelo	Miconazole nitrate	12243808	8
Caelo	Miconazole nitrate	12243806	1
Caesar&Loretz GmbH D-4...	Miconazole nitrate	12243808	1
Caesar&lorenz,Phoenix	Miconazole nitrate	12374301	1
Fagron	Miconazole nitrate	12243808	2
Caelo	Miconazole nitrate	12374301	2
Alliance Healthcare	Miconazole nitrate	12374307	1
Caelo	Miconazole nitrate	12374308	5
Noweda	Miconazole nitrate	12A16-N02	5
Großhandel	Miconazole nitrate	12374308	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Miconazole nitrate	12A16-N02	3
Bionorica /Phönix	Miconazole nitrate	12C13B03-279593	1
Fagron	Miconazole nitrate	12H10-N02	6
Klenk	Miconazole nitrate	12h10-n02	1
Noweda	Miconazole nitrate	12K02-N06	3
Caelo	Miconazole nitrate	12k02n06	1
Euro OTC	Miconazole nitrate	1307025-01	2
Fagron	Miconazole nitrate	13091R	1
Caelo	Miconazole nitrate	13185601	7
Caelo	Miconazole nitrate	13185602	5
Herstellung	Miconazole nitrate	13185602	1
Caelo	Miconazole nitrate	13185603	15
Caesar & Loretz GmbH, 4...	Miconazole nitrate	13185602	1
Caesar&Loretz GmbH/Anzag	Miconazole nitrate	13185603	1
Caelo	Miconazole nitrate	13185611	11
20; 04.12.13	Miconazole nitrate	13185611	2
Fagron	Miconazole nitrate	1328-N06	1
Alliance Health 05.02.2...	Miconazole nitrate	13352801	3
Sanacorp	Miconazole nitrate	13352801	1
Phoenix	Miconazole nitrate	13352801	1
Fagron	Miconazole nitrate	13A14-B09	2
Fagron	Miconazole nitrate	13A14B09283005	1
Fagron	Miconazole nitrate	13D22-N14	14
Fagron	Miconazole nitrate	13A14-B09-287453	1
Fagron	Miconazole nitrate	13A14B09287487	1
Fagron	Miconazole nitrate	13d22-n14	1
Caelo	Miconazole nitrate	13D22-N14	2
Fagron	Miconazole nitrate	13E13-N04	2
Fagron	Miconazole nitrate	13E13-N08	2
Fagron	Miconazole nitrate	13H28N06	1
Caelo	Miconazole nitrate	13H28-N06	1
Phönix	Miconazole nitrate	13H28-N06	1
Fagron	Miconazole nitrate	13H28-N06	2
Fagron	Miconazole nitrate	17011307	1
Fagron	Miconazole nitrate	14B18-B02-291250	1
Fagron	Miconazole nitrate	20081201	1
Fagron	Miconazole nitrate	27061202	1
Caelo	Miconazole nitrate		1
Caelo	Miconazole nitrate	28051306	1
Fagron	Miconazole nitrate	2900/08/12	4
Fagron	Miconazole nitrate	31101306	1
Caelo	Miconazole nitrate	411092-2-P	1
Caelo	Miconazole nitrate	AKD9	1
Caelo	Miconazole nitrate	1307025-02	1
Fargon	Miconazole nitrate	14D25-B06-294959	1
Caelo	Miconazole nitrate	P143/14	1
Fagron	Miconazole nitrate	14b18-b02-291247	1
EUro/AHD	Miconazole nitrate	12243808	1
Anzag	Miconazole nitrate	12374301	3
AHD	Miconazole nitrate	12374307	1

- 55 427 spectra from 335 *Apo-Ident* customers from a total of 20 455 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Miconazole nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Miconazole nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	404	0	75 474
Type B	0	494	4	80 850
Type C	0	574	0	55 427

The substance/substance group *Miconazole nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5149 %)
Type B	100.0000 % (> 99.9853 %)	99.1968 % (> 98.5944 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 98.9547 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20210	20210	0.00	36.46
20817	21900	0.96	50.36
20875	21900	6.75	46.07
20905	21900	5.34	47.28
21350	21350	0.00	50.15
21649	21350	5.39	50.04
21900	21900	0.00	51.79
22630	22630	0.00	62.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Minoxidil**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20879-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Minoxidil; Minoxidilum

Special notes

When selecting the *Minoxidil* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Minoxidil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Minoxidil	13039501	20879	40	20130306
Caelo	Minoxidil	14093701	21359	40	20140428
Euro OTC	Minoxidil	1311038-01	21630	40	AR-15-FG-007848-01
Euro OTC	Minoxidil	1411006-01	21912	40	20141210
Euro OTC	Minoxidil	1509035	21933	40	20151016*
Euro OTC	Minoxidil	1602013	22365	40	20160225*
Euro OTC	Minoxidil	1612011	22982	40	20170130*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 280 spectra of 7 reference samples from the substance/substance group *Minoxidil*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 379 spectra of 10 reference samples from the substance/substance group *Minoxidil*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Minoxidil	14093701	21361	40
Euro OTC	Minoxidil	1311038-01	21630 [†]	19
Euro OTC	Minoxidil	1411006-01	21912 [†]	20
Euro OTC	Minoxidil	1509035	21933 [†]	20
Euro OTC	Minoxidil	1602013	22365 [†]	20
Euro OTC	Minoxidil	1607007	22688	40
Euro OTC	Minoxidil	1411006-01	21912SI	60
Euro OTC	Minoxidil	1509035	21933SI	60
Euro OTC	Minoxidil	1602013	22365SI	60
Euro OTC	Minoxidil	1612011	22982SI	40

- 80 969 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 684 spectra from 166 *Apo-Ident* customers from 183 batches from the substance/substance group *Minoxidil*.

Supplier	Substance	Batch	Spectra
Euro OTC	Minoxidil	4/13	2
Bombastus	Minoxidil	4/13	1
icrom spa	Minoxidil	511v	1
ICROM	Minoxidil	6/12	1
Euro OTC	Minoxidil	6/12	1
Fagron	Minoxidil	7/13	1
Euro OTC	Minoxidil	10/13	1
Audor Pharma	Minoxidil	414E-02844	1
Caelo	Minoxidil	5081502	1
Fagron	Minoxidil	612212844	1
Euro OTC	Minoxidil	1009042-01	3
Fagron	Minoxidil	11021402	1
Fagron	Minoxidil	10J14-N19	1
Euro OTC	Minoxidil	104029-02	1
EuRho	Minoxidil	1105030-02	1
EuRho	Minoxidil	1108039-02	2
Euro OTC	Minoxidil	1102010-02	1
Euro OTC	Minoxidil	1108039-03	1
Euro OTC	Minoxidil	1112024-01	3
Fagron	Minoxidil	111012010	1
Euro OTC	Minoxidil	1112024-02	6
Anzag	Minoxidil	1112024-02	1
Euro OTC	Minoxidil	1112024-03	6
Fiebig ek: 36.06EUR 31.0812	Minoxidil	111202403	1
Caelo	Minoxidil	11150207	2
Phönix	Minoxidil	1112024-03	1
Euro/Gehe	Minoxidil	1112024-03	1
Bombastus	Minoxidil	1112024-03	1
Caelo	Minoxidil	11150209	1
Post-Apotheke	Minoxidil	11302005	2
Caelo	Minoxidil	11302003	2
Caelo	Minoxidil	11302005	1
Phagron/Ph	Minoxidil	11E17-N07	2
Fagron	Minoxidil	11K11-N09	2
Caelo	Minoxidil	11e17-n07	1
Phoenix 21.02.2013	Minoxidil	12023901	1
Sanacorp	Minoxidil	120056-01	1
Fagron	Minoxidil	11E17-N07	1
Caelo	Minoxidil	12023901	2
Caelo	Minoxidil	12023902	2
Caelo	Minoxidil	12023907	6
Caelo	Minoxidil	1203035	1
Euro OTC	Minoxidil	1203035	1
Caelo	Minoxidil	12023908	2
Euro OTC	Minoxidil	1203035-0	1
Euro OTC	Minoxidil	1203035-01	12
Euro OTC	Minoxidil	120303501	2
Icrom Spa	Minoxidil	1203035-01	1
Anzag 18.10.12 ek:40,14	Minoxidil	1203035-01	1
Anzag 14.11.12 ek:40,14	Minoxidil	120303501	1
Sanacorp	Minoxidil	1203035-01	1
Euro OTC	Minoxidil	120303502	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Minoxidil	1203035-02	8
Phönix	Minoxidil	1203035-02	2
Euro OTC	Minoxidil	1203035-03	13
Caelo	Minoxidil	120303503	1
Fagron	Minoxidil	120303503	1
Euro OTC	Minoxidil	120303503	1
Anzag 07.02.13 ek: 40,14EUR	Minoxidil	120303503	1
Alliance Healthc. 15.05...	Minoxidil	1203035-03	1
Euro OTC	Minoxidil	12100056-01	1
Euro OTC	Minoxidil	12100560	1
Sanacorp	Minoxidil	1210056-01	1
Euro OTC	Minoxidil	1210056-01	17
Alliance Healthcare	Minoxidil	1210056-01	1
Europharm/Sanacorp	Minoxidil	1210056-01	1
Caelo	Minoxidil	1210056-01	2
Euro OTC	Minoxidil	121005601	1
AHD	Minoxidil	1210056-01	1
Euro OTC	Minoxidil	1210056-02	25
Caelo	Minoxidil	1210056-02	3
Alliance Healthcare	Minoxidil	1210056-02	1
Sanacorp	Minoxidil	1210056-02	2
AHC 14.08.13 EK40,14	Minoxidil	1210056-02	1
Caelo	Minoxidil	12273703	2
Caelo	Minoxidil	12273704	5
Caelo	Minoxidil	12273710	1
Gehe 02.07.2013	Minoxidil	123039503	1
Fagron	Minoxidil	12A25-N04	5
Fagron	Minoxidil	12C29-N050087/240	1
Fagron	Minoxidil	12C29-N050145/240	1
Noweda	Minoxidil	12C29-N05	1
Fagron	Minoxidil	12C29-N05	4
Klenk	Minoxidil	12c29-n05	1
Hedinger/Sanacorp	Minoxidil	12C29-N05	1
Fagron	Minoxidil	12H07-N03	20
Fagron	Minoxidil	12H07N03	1
Fagron	Minoxidil	12H07-N03	1
Fagron	Minoxidil	12H07-N030265/432	1
Fagron	Minoxidil	12H07-No3	1
Fagron	Minoxidil	12H07-N03	1
Caelo	Minoxidil	13039501	8
Caelo	Minoxidil	13/23-N07	1
Caesar & Loretz GmbH	Minoxidil	13039501	1
Caelo	Minoxidil	13039503	3
Euro OTC	Minoxidil	1304029-01	15
Alliance Health 04.11.2...	Minoxidil	13039503	1
euroct/Gehe	Minoxidil	1304029-01	1
Phönix	Minoxidil	1304029-01	1
Caelo	Minoxidil	130402901	1
Euro OTC	Minoxidil	130402901	1
Apotärze	Minoxidil	1304029-02	3
EuRho / Noweda	Minoxidil	1304029-02	1
Euro OTC	Minoxidil	1304029-02	12
Euro OTC	Minoxidil	130402902	1
Caelo	Minoxidil	1304029-02	1
Caelo	Minoxidil	130402902	1
Sanacorp	Minoxidil	1304029-02	1
Euro OTC	Minoxidil	1311038-01	26
Caelo	Minoxidil	1309501	1
PhOENIX 19.03.2012	Minoxidil	1311038-01	2
Caelo	Minoxidil	1311038-01	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Minoxidil	131103801	4
AHD	Minoxidil	1311038-01	1
Ichthyol-Gesellschaft	Minoxidil	1311038-01	1
Fagron	Minoxidil	1311038-01	1
Euro OTC	Minoxidil	131138-01	1
Caelo	Minoxidil	13179501	6
Sanacorp	Minoxidil	13179501	2
Caelo	Minoxidil	13179502	8
Noweda	Minoxidil	13179502	2
Caelo	Minoxidil	13179503	4
Caelo	Minoxidil	13179504	2
PhOENIX 19.03.2012	Minoxidil	13179503	2
Caelo	Minoxidil	13373106	2
Anzag	Minoxidil	13E13-N10	1
Fagron	Minoxidil	13E13-N10	17
Fargron	Minoxidil	13E13-N10	2
Doppeleiche Apotheke	Minoxidil	13E13-N10	2
Caelo	Minoxidil	13E13-N10	1
Fagron	Minoxidil	13E13N10	1
Fagron	Minoxidil	13H07-N03	1
Fagron	Minoxidil	13I23-N07	8
Caelo	Minoxidil	13I23-N07	2
Fagron	Minoxidil	13J23N07	2
Fagron	Minoxidil	13K04-B05-290377	5
Fagron	Minoxidil	13K04-B05-0004	1
Fagron	Minoxidil	13J29-B02	1
Caelo	Minoxidil	13K04B05290380	1
Fagron	Minoxidil	13K04-B05-290379	2
Fagron	Minoxidil	13K04-B05-290380	4
Fagron	Minoxidil	13I23-N07	1
Euro OTC	Minoxidil	14050281	1
Euro OTC	Minoxidil	1405028-01	23
sanacorp	Minoxidil	1405028-01	1
Euro OTC	Minoxidil	140502801	2
Euro/ Phönix	Minoxidil	1405028-01	1
Sanacorp	Minoxidil	1405028-01	1
Caelo	Minoxidil	1405028-01	2
Sanacorp	Minoxidil	140502801	1
Sanacorp	Minoxidil	14093702	1
Euro OTC	Minoxidil	1405028-1	1
Euro/Gehe	Minoxidil	140528-01	1
Euro OTC	Minoxidil	140528-01	1
Sanacorp	Minoxidil	14093701	1
Caelo	Minoxidil	14093702	2
Caelo	Minoxidil	14093703	3
Caelo	Minoxidil	14093706	2
Noweda	Minoxidil	14093703	1
Caelo	Minoxidil	1411006-01	2
Caelo	Minoxidil	14093707	1
Euro OTC	Minoxidil	1411006-01	24
Alliance health	Minoxidil	1411006-01	3
Euro OTC	Minoxidil	141100601	5
Fagron	Minoxidil	1411006-01	1
Euro/Phönix	Minoxidil	1411006-01	1
Caelo	Minoxidil	14234505	4
Fagron	Minoxidil	14B04-B07	1
Caelo	Minoxidil	14234502	1
Euro OTC	Minoxidil	1411006601	1
Caelo	Minoxidil	14234509	3
Fagron	Minoxidil	1420001962	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Minoxidil	14B04-B07-290883	3
Fagron	Minoxidil	14L03-B02	2
Fagron	Minoxidil	14L03-B02-301429	6
Fagron	Minoxidil	14L03-B02301429	1
Fagron	Minoxidil	14L03-B02-301430	2
Fagron	Minoxidil	14L03-B02-301431	1
Euro OTC	Minoxidil	1504013-01	18
Euro OTC	Minoxidil	150401-01	1
Fagron	Minoxidil	14L03-B02-301430	1
Fagron	Minoxidil	14L03-B02-301541	1
Fagron	Minoxidil	15F02B09	1
Sanacorp	Minoxidil	1504013-01	1
Caelo	Minoxidil	1504013-01	4
Euro OTC	Minoxidil	1504013-02	13
Euro	Minoxidil	1504013-01	2
AHD	Minoxidil	1504013-02	1
Euro OTC	Minoxidil	1509035-01	15
Euro/Anzag	Minoxidil	150903501	1
Fagron	Minoxidil	1520000768	3
Caelo	Minoxidil	15436202	2
Caelo	Minoxidil	15230802	3
Caelo	Minoxidil	15230811	1
Caelo	Minoxidil	15230804	1
Fagron	Minoxidil	15E19-06-308183	1
Fagron	Minoxidil	15E19-B06-308181	2
Fagron	Minoxidil	15E19-B06-308180	1
Fagron	Minoxidil	15e19-b06-308180	1
Fagron	Minoxidil	15E19-B06-308182	1
Fagron	Minoxidil	15E-19-B06-308182	1
Caelo	Minoxidil	15E19-B06-308183	1
Fagron	Minoxidil	15E19-B06-308183	2
Fagron	Minoxidil	15E19-B06-308183	1
Fagron	Minoxidil	15K17-B05-320188	1
Fagron	Minoxidil	15K17-B05-318241	1
Fagron	Minoxidil	15K17-B05-318240	1
Fagron	Minoxidil	15F02-B08	1
Caelo	Minoxidil	15K17-B06-321926	1
Euro OTC	Minoxidil	1602013-01	13
Caelo	Minoxidil	1602013-01	4
Phoenix	Minoxidil	1602013-02	1
Caelo	Minoxidil	1602013-02	2
Euro OTC	Minoxidil	1602013-02	2
Caelo	Minoxidil	160201302	1
Euro OTC	Minoxidil	16070007-01	1
Euro OTC	Minoxidil	1607007	1
Euro OTC	Minoxidil	1607007-01	6
Caelo	Minoxidil	17011602	1
phönix	Minoxidil		1
Euro OTC	Minoxidil	2002312844	1
Caelo	Minoxidil	240912010	1
Caelo	Minoxidil	240813001	1
Caelo	Minoxidil	20151112-5	1
Caelo	Minoxidil	22031402	1
Fagron	Minoxidil	27081301	1
Fagron	Minoxidil	26021303	1
Caelo	Minoxidil	2905047-01	1
Fagron	Minoxidil	26111302	1
Euro OTC	Minoxidil	29071402	1
Caelo	Minoxidil	3013M-02844	2
Caelo	Minoxidil	2913A-02844	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Minoxidil	31051305	1
Audor Pharma	Minoxidil	AP001/11M	1
Fagron	Minoxidil	4110I-02844	1
Euro OTC	Minoxidil	700158	1
Gehe	Minoxidil	AP006/13M	1
Audor Pharma	Minoxidil	AP006/13M	1
Audor Pharma	Minoxidil	AP007/15M	1
Audor Pharma	Minoxidil	AP008/14M	2
Audor Pharma	Minoxidil	AP010/12M	6
Audor Pharma	Minoxidil	AP020/11M	5
Audor Pharma	Minoxidil	AP001/16M	2
Audor Pharma	Minoxidil	AP23601ML	1
Audor Pharma	Minoxidil	AP016/15M	1
Audor Pharma	Minoxidil	AP088/14M	1
Euro OTC	Minoxidil		1
apo-ident	Minoxidil	Euro-OTC	1
Caelo	Minoxidil		4
Fagron	Minoxidil	Fagron	1
Hedinger	Minoxidil	14B04-B07	2
Euro OTC	Minoxidil	1108039-01	1
GEHE	Minoxidil	11302003	1
Noweda	Minoxidil	11150207	1
Caelo	Minoxidil	11K11-n09	1
Caelo	Minoxidil	1203035-01	1
EUro/AHD	Minoxidil	1203035-03	2
Fagron	Minoxidil	1210056-02	1
A.H.D	Minoxidil	1210056-01	1
Euro OTC	Minoxidil	13001	1
Caelo	Minoxidil	13179501-3467312121	1

- 55 317 spectra from 334 *Apo-Ident* customers from a total of 20 433 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Minoxidil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Minoxidil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	254	26	75 598
Type B	0	373	6	80 969
Type C	0	672	12	55 317

The substance/substance group *Minoxidil* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	90.7143 % (> 89.6429 %)
Type B	100.0000 % (> 99.9853 %)	98.4169 % (> 97.6253 %)
Type C	100.0000 % (> 99.8622 %)	98.2456 % (> 97.8070 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20879	22365	1.71	35.31
21359	21933	4.38	36.85
21630	21630	0.00	35.67
21912	21933	3.42	34.27
21933	21933	0.00	33.55
22365	22365	0.00	34.14
22982	22982	0.00	35.52

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Mometasone furoate, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20100-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mometasone furoate, micronized; Mometasoni furoas micronisatum; Mometasonum furanicum micronisatum

Special notes

When selecting the *Mometasone furoate, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mometasone furoate, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mometasone furoa...	09F22-N05	20100	40	F 2010 000 093
Fagron	Mometasone furoa...	13F17-N01	20850	30	20130620
Caelo	Mometasone furoa...	13304605	21374	40	20130926
Euro OTC	Mometasone furoa...	1403015-01	21602	40	20140503
Euro OTC	Mometasone furoa...	1510036	22238	40	20151118*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Mometasone furoa...	160286	22433	40	20160316*
Fagron	Mometasone furoa...	16A20-B06-319750	22887	40	20160209
Fagron	Mometasone furoa...	13F17-N01	20850SI	29	20130620
Caelo	Mometasone furoa...	13304605	21374SI	25	20130926
Euro OTC	Mometasone furoa...	1403015-01	21602SI	21	20140503
Euro OTC	Mometasone furoa...	1510036	22238SI	20	20151118*
Fagron	Mometasone furoa...	16A20-B06-319750	22887SI	30	20160209

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 395 spectra of 12 reference samples from the substance/substance group *Mometasone furoate, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 483 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 294 spectra of 13 reference samples from the substance/substance group *Mometasone furoate, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mometasone furoate, micronized	13304605	21374 [†]	20
Euro OTC	Mometasone furoate, micronized	1403015-01	21602 [†]	20
Euro OTC	Mometasone furoate, micronized	1510036	22238 [†]	20
Caelo	Mometasone furoate, micronized	160286	22433 [†]	20
Euro OTC	Mometasone furoate, micronized	1606021	22715	40
Caelo	Mometasone furoate, micronized	163532	23046	40
Fagron	Mometasone furoate, micronized	13F17-N01	20850SI [†]	15
Caelo	Mometasone furoate, micronized	13304605	21374SI [†]	13
Euro OTC	Mometasone furoate, micronized	1403015-01	21602SI [†]	10
Euro OTC	Mometasone furoate, micronized	1510036	22238SI [†]	10
Caelo	Mometasone furoate, micronized	160286	22433SI	30
Euro OTC	Mometasone furoate, micronized	1606021	22715SI	33
Caelo	Mometasone furoate, micronized	163532	23046SI	23

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 81 054 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 399 spectra from 121 *Apo-Ident* customers from 157 batches from the substance/substance group *Mometasone furoate, micronized*.

Supplier	Substance	Batch	Spectra
Sanacorp	Mometasone furoate, micronized	1/AKD4	1
Fagron	Mometasone furoate, micronized	5/0715	1
Caelo	Mometasone furoate, micronized	11H10-N01	1
Fagron	Mometasone furoate, micronized	11K28-N09	2
Caelo	Mometasone furoate, micronized	12351202	4
Caelo	Mometasone furoate, micronized	12351205	2
Caelo	Mometasone furoate, micronized	12351215	3
Caelo	Mometasone furoate, micronized	12351208	1
EuRho/Phönix	Mometasone furoate, micronized	1307037-01	2
Phönix	Mometasone furoate, micronized	13/23-N02	2
Caelo	Mometasone furoate, micronized	13304604	1
Caelo	Mometasone furoate, micronized	13304605	5
Caelo	Mometasone furoate, micronized	13304606	2
Caelo	Mometasone furoate, micronized	13304609	1
Caelo	Mometasone furoate, micronized	13304612	1
Fagron	Mometasone furoate, micronized	13D08-N06	16
Fagron	Mometasone furoate, micronized	13Do8-N06	1
Fagron	Mometasone furoate, micronized	13H13-N04	10
Fagron	Mometasone furoate, micronized	13J23-N02	20
GEHE 17.04.2014	Mometasone furoate, micronized	13J23-N02	1
Fagron	Mometasone furoate, micronized	13j23-N02	1
Caelo	Mometasone furoate, micronized	13J23-N02	3
Euro OTC	Mometasone furoate, micronized	1403015-01	1
Phönix Gotha	Mometasone furoate, micronized	1403015-01	1
Euro OTG	Mometasone furoate, micronized	1403015-01	1
Euro OTC	Mometasone furoate, micronized	1408010-01	2
Caelo	Mometasone furoate, micronized	14281102	2
EuRho	Mometasone furoate, micronized	1408010-01	1
Caelo	Mometasone furoate, micronized	14281103	1
Fagron	Mometasone furoate, micronized	14C07-B05	1
Fagron	Mometasone furoate, micronized	14C07-B05-291266	3
Fagron	Mometasone furoate, micronized	14C07-B05-291264	1
Caelo	Mometasone furoate, micronized	14C07-B05-291268	7
Fagron	Mometasone furoate, micronized	14C07-B05-291268	5
Fagron	Mometasone furoate, micronized	14C07B05291268	1
Fagron	Mometasone furoate, micronized	14E20-B04	3
Fagron	Mometasone furoate, micronized	14E20-B04-291265	4
Fagron	Mometasone furoate, micronized	14e20b04291265	1
Fagron	Mometasone furoate, micronized	14e20-b04-291265	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
Sanacorp	Mometasone furoate, micronized	14E20-B04-291267	1
Fagron	Mometasone furoate, micronized	14E20-B04-291267	4
Fagron	Mometasone furoate, micronized	14e20-b04-291267	1
Caelo	Mometasone furoate, micronized	14E20-B04-291267	4
Phönix	Mometasone furoate, micronized	14E20-B04-291267	1
Fagron	Mometasone furoate, micronized	14E20-B04-291269	2
Fagron	Mometasone furoate, micronized	14E20-B04-294645	5
Fagron	Mometasone furoate, micronized	14E20-B04-302374	1
Fagron	Mometasone furoate, micronized	14H06-B07297240	1
Fagron	Mometasone furoate, micronized	14H06-B07-297240	5
Caelo	Mometasone furoate, micronized	14H06-B07298481	1
Fagron	Mometasone furoate, micronized	14H06-B07-298481	1
Fagron	Mometasone furoate, micronized	14H06-B07-298482	7
Fagron	Mometasone furoate, micronized	14H06-B07-302376	2
Caelo	Mometasone furoate, micronized	15/11-B02	3
Fagron	Mometasone furoate, micronized	15/11-B02-31447	1
Fagron	Mometasone furoate, micronized	15/11-B02-315705	2
Fagron	Mometasone furoate, micronized	15/11-B02-314479	2
Fagron	Mometasone furoate, micronized	15/11-B02-316705	1
Euro OTC	Mometasone furoate, micronized	1504012-01	8
Euro OTC	Mometasone furoate, micronized	1510036-01	4
Caelo	Mometasone furoate, micronized	1510036-001	1
Euro OTC	Mometasone furoate, micronized	1504012-02	2
Caelo	Mometasone furoate, micronized	15110301	3
Caelo	Mometasone furoate, micronized	15110305	1
Fagro	Mometasone furoate, micronized	1511B02	1
Caelo	Mometasone furoate, micronized	15189804	2
Caelo	Mometasone furoate, micronized	15189801	1
Caelo	Mometasone furoate, micronized	15189807	3
Caelo	Mometasone furoate, micronized	15189809	1
Caelo	Mometasone furoate, micronized	15189806	1
Caelo	Mometasone furoate, micronized	15B11-B03-304121	2
Fagron	Mometasone furoate, micronized	15B11-B03-304121	6
Ebert u. Jacobi 23.0...	Mometasone furoate, micronized	15279004	2
Fagron	Mometasone furoate, micronized	15B11-B03-304120	3
Fagron	Mometasone furoate, micronized	15B11-B03	1
Fagron	Mometasone furoate, micronized	15B11-B03-304122	4
Fagron	Mometasone furoate, micronized	15B11B03304121	1
Caelo	Mometasone furoate, micronized	15B11B03304122	1
Fagron	Mometasone furoate, micronized	15B11B03304122	1
Fagron	Mometasone furoate, micronized	15B11-B03-304123	7
Fagron	Mometasone furoate, micronized	15B11-B03-304124	2
Fagron	Mometasone furoate, micronized	15B11-B03-308276	1
Euro OTC	Mometasone furoate, micronized	15B11-B03-308860	1
Fagron	Mometasone furoate, micronized	15b11-b03-304124	1
Fagron	Mometasone furoate, micronized	15B11B03308860	1
Fagron	Mometasone furoate, micronized	15G08-B11-310864	3
Fagron	Mometasone furoate, micronized	15G08-B11	1
Caelo	Mometasone furoate, micronized	15G08-B11-310864	1
Fagron	Mometasone furoate, micronized	15G08-B11-317182	5
Fagron	Mometasone furoate, micronized	15G08-B11-312233	2
Caelo	Mometasone furoate, micronized	15G08-B11-317182	1
Euro OTC	Mometasone furoate, micronized	15G08-B11-317182	1
Fagron	Mometasone furoate, micronized	15G08B11322738	1
Fagron	Mometasone furoate, micronized	15G08-B11-322738	2
Fagron	Mometasone furoate, micronized	15G-B11-310864	1
Caelo	Mometasone furoate, micronized	16028602	3
Caelo	Mometasone furoate, micronized	1602809	1
Fagron	Mometasone furoate, micronized	15J11-B02-315705	1
Fagron	Mometasone furoate, micronized	15I11-B02-314479	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Mometasone furoate, micronized	16028601	1
Caelo	Mometasone furoate, micronized	16028606	2
Euro OTC	Mometasone furoate, micronized	160602101	1
Euro OTC	Mometasone furoate, micronized	1606021-01	2
Caelo	Mometasone furoate, micronized	16028609	2
Caelo	Mometasone furoate, micronized	16028607	1
Fagron	Mometasone furoate, micronized	16A20-B06	1
Fagron	Mometasone furoate, micronized	16A20-B06-319748	1
Fagron	Mometasone furoate, micronized	16A20-B06-319749	3
Fagron	Mometasone furoate, micronized	1716I-07010	1
Fagron	Mometasone furoate, micronized	1814E3640	1
Caelo	Mometasone furoate, micronized	2/AKD2	1
Fagron	Mometasone furoate, micronized	2114M3640	1
Fagron	Mometasone furoate, micronized	3313A-07030	1
Audor Pharma	Mometasone furoate, micronized	APMOM010/0116M	1
Fagron	Mometasone furoate, micronized	2215I-07030	1
Fagron	Mometasone furoate, micronized	NS1513M	1
Caelo	Mometasone furoate, micronized	N01352M	1
Fagron	Mometasone furoate, micronized	NT1568M	4
Synthexim/Phoenix	Mometasone furoate, micronized	NT1568M	1
Fagron	Mometasone furoate, micronized	NU2504M	1
Fagron	Mometasone furoate, micronized	10G27-N05	1
Caelo	Mometasone furoate, micronized	NU0698M	1
Fagron	Mometasone furoate, micronized	11F08-N03	2
Fagron	Mometasone furoate, micronized	11H10-N01	3
Caesar & Loretz GmbH, 4...	Mometasone furoate, micronized	11H10-N04	1
v.d.l	Mometasone furoate, micronized	11h10-n04	1
Phönix, 14.10.2013	Mometasone furoate, micronized	12351207	1
Caesar & Loretz GmbH, 4...	Mometasone furoate, micronized	12B22-N01	1
Fagron	Mometasone furoate, micronized	10C29-N10	1
Caelo	Mometasone furoate, micronized	12339604	1
Caelo	Mometasone furoate, micronized	12351203	1
Caelo	Mometasone furoate, micronized	1235210	1
Fagron	Mometasone furoate, micronized	13/23-N02	1
Euro OTC	Mometasone furoate, micronized	1307037-01	1
Phönix	Mometasone furoate, micronized	13D08-N06	1
Fagron	Mometasone furoate, micronized	13D08N06	1
FARGON	Mometasone furoate, micronized	13d08-n06	1
Fagron	Mometasone furoate, micronized	13F17-N01	7
Fagron	Mometasone furoate, micronized	13F27-N02	6
Fagron	Mometasone furoate, micronized	13f17-n01	1
Fagron	Mometasone furoate, micronized	13F27-N02	1
Fagron	Mometasone furoate, micronized	13j23n02	1
Alliance Health 27.01.2...	Mometasone furoate, micronized	13J23-N02	1
Caelo	Mometasone furoate, micronized		2
Caelo	Mometasone furoate, micronized	14281101	2
Phoenix	Mometasone furoate, micronized	14C07-B05-291268	1
Fagron	Mometasone furoate, micronized	11C02-N03	4
Fagron	Mometasone furoate, micronized	10805-N12	1
Fagron	Mometasone furoate, micronized	11h10-n04	1
Caelo	Mometasone furoate, micronized	12035601	2
Kehr	Mometasone furoate, micronized	12/29-N03	1
Fagron	Mometasone furoate, micronized	12/29-No3	1
Euro OTC	Mometasone furoate, micronized	1203024-02	1
Caesar & Loretz GmbH	Mometasone furoate, micronized	12035601	1
Caelo	Mometasone furoate, micronized	12351210	1
Fagron	Mometasone furoate, micronized	12B22-N01	4
Caeo	Mometasone furoate, micronized	12351201	1
Caelo	Mometasone furoate, micronized	12035607	1
Caelo	Mometasone furoate, micronized	12E02-N11	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Mometasone furoate, micronized	12B22-N04	1
Fagron	Mometasone furoate, micronized	12e02-n11	1
Fagron	Mometasone furoate, micronized	12E02-N11	4
Fagron	Mometasone furoate, micronized	12H09-N02	11
Anzag	Mometasone furoate, micronized	12H09-N02	1
Fagron	Mometasone furoate, micronized	12J29-N03	9
Fagron	Mometasone furoate, micronized	12I29-N03	1
Anzag	Mometasone furoate, micronized	12J29N03	1
Caelo	Mometasone furoate, micronized	13D08-N06	1
Caelo	Mometasone furoate, micronized	1304011-01	1
Anzag	Mometasone furoate, micronized	13D08-N06	1
Gehe	Mometasone furoate, micronized	13D08-N06	1
Caelo	Mometasone furoate, micronized	13F27-N02	2
Fagron	Mometasone furoate, micronized	13F17-N01	1
Fagron	Mometasone furoate, micronized	13F7-N01	1
Fagron	Mometasone furoate, micronized	13H13-N04	1
Phönix	Mometasone furoate, micronized	15b11-b03-30412	1
Caelo	Mometasone furoate, micronized	14E20-B04	1
Fagron	Mometasone furoate, micronized	NS0420M	2
Caelo	Mometasone furoate, micronized	NT1568M	1
Fagron	Mometasone furoate, micronized	11H10-N04	1
Fargon	Mometasone furoate, micronized	14h06-b07-298481	1
Caeo/Noweda	Mometasone furoate, micronized	15279003	1
Fagron	Mometasone furoate, micronized	15b11-b03-308276	1
Fagron	Mometasone furoate, micronized	2714U-07030	1
Herbasinica	Mometasone furoate, micronized	12035602	1
Caelo	Mometasone furoate, micronized	12035605	1
Fagron	Mometasone furoate, micronized	12J29-N01	1
Holdermann	Mometasone furoate, micronized	13D08-N06	1
Gehe	Mometasone furoate, micronized	13H13-N04	2
Holdermann	Mometasone furoate, micronized	14C07-B05-29126	1
Caelo	Mometasone furoate, micronized	701834-0002	1
Fagron	Mometasone furoate, micronized	11k28-n09	1
Fargon	Mometasone furoate, micronized	13H13-N04	1

- 55 602 spectra from 335 *Apo-Ident* customers from a total of 20 457 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mometasone furoate, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mometasone furoate, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	391	4	75 483
Type B	0	292	2	81 054
Type C	0	354	45	55 602

The substance/substance group *Mometasone furoate, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	98.9873 % (> 98.2278 %)
Type B	100.0000 % (> 99.9853 %)	99.3197 % (> 98.2993 %)
Type C	100.0000 % (> 99.8622 %)	88.7218 % (> 87.9699 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20100	20100	0.00	82.18
20850	22433	5.30	71.74
21374	20100	29.40	74.07
21602	22433	6.59	78.39
22238	22238	0.00	71.99
22433	22433	0.00	62.88
22887	22238	5.31	67.13

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Monostereates**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20039-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Monostereates; Glycerinum monostearinicum 40-55%; Glycerinum monostearinicum 60; Glycerinum monostearinicum emulsificantes; Glycerol monostearate 40-55%; Glycerol monostearate 60; Glycerol monostearate, self-emulsifying; Glyceroli monostearates 40-55%; Glyceroli monostearates 60; Glyceroli monostearates emulsificantes; Sorbitan stearate; Sorbitani stearas; Sorbitanum monostearinicum

Special notes

When selecting the *Monostereates* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Monostereates*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Glycerol monoste...	08J14-M04	20039	30	I 2009 000 349
Caelo	Sorbitan stearate	11145401	20351	40	AR-12-FG-011575-01
Caelo	Glycerol monoste...	12105705	20691	80	20120424

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Glycerol monoste...	12210401	20751	80	1407214
Caelo	Glycerol monoste...	12210401	20783	40	20120726
Caelo	Sorbitan stearate	12274801	20828	40	20120924
Caelo	Glycerol monoste...	12105720	20867	40	20120424
Caelo	Glycerol monoste...	13109304	21093	40	1407633
Caelo	Glycerol monoste...	13232604	21437	40	1504599
Caelo	Glycerol monoste...	14099903	21446	40	AR-15-FG-000732-02
Caelo	Glycerol monoste...	14240607	21576	40	1412120
Caelo	Glycerol monoste...	14240607	21585	40	20140815
Fagron	Sorbitan stearate	14J07-B02-299399	21885	40	AR-16-FG-004368-01
Caelo	Glycerol monoste...	15286302	21982	40	20150911
Caelo	Glycerol monoste...	14308310	21993	40	20150109
Fagron	Glycerol monoste...	15E13-B03-305532	22277	40	20150703
Caelo	Glycerol monoste...	15286302	22320	40	AR-16-FG-009226-01
Caelo	Glycerol monoste...	154450	22464	40	20160225*
Caelo	Glycerol monoste...	161646	22623	40	20160727*
Caelo	Glycerol monoste...	16030301	22667	40	20160204
Caelo	Glycerol monoste...	162338	22743	40	20160822*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 910 spectra of 21 reference samples from the substance/substance group *Monostereates*. These samples are listed above in the [calibration samples](#) section.
- 74 968 spectra from a total of 1558 batches from further 380 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 1051 spectra of 28 reference samples from the substance/substance group *Monostereates*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Glycerol monostearate 40-55%	8J14-M04	20039 [†]	1
Caelo	Glycerol monostearate 60	10097203	20175	40

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Glycerol monostearate, self-...	10080113	20286	30
Caelo	Glycerol monostearate 60	1127201902	20576	40
Caelo	Glycerol monostearate 60	11272902	20608	40
Caelo	Glycerol monostearate, self-...	11079309	20621	80
Caelo	Glycerol monostearate 60	11272902	20677	80
Fagron	Sorbitan stearate	11I26-N09	20736	40
Fagron	Glycerol monostearate, self-...	11I15-N09	20746	80
Fagron	Glycerol monostearate, self-...	12B14-N10	20786	40
Caelo	Glycerol monostearate 60	13232604	21437 [†]	20
Caelo	Glycerol monostearate 40-55%	14099903	21446 [†]	20
Fagron	Glycerol monostearate 40-55%	14C12-B40-292622	21545	60
Caelo	Glycerol monostearate, self-...	14240607	21576 [†]	20
Caelo	Glycerol monostearate, self-...	14240607	21585 [†]	20
Fagron	Sorbitan stearate	14J07-B02-299399	21885 [†]	20
Caelo	Glycerol monostearate 60	15286302	21982 [†]	20
Caelo	Glycerol monostearate, self-...	14308310	21993 [†]	20
Fagron	Glycerol monostearate 40-55%	15E13-B03-305532	22277 [†]	20
Caelo	Glycerol monostearate, self-...	14308310	22278	60
Caelo	Glycerol monostearate 60	15286302	22320 [†]	20
Caelo	Glycerol monostearate, self-...	14308310	22341	60
Caelo	Glycerol monostearate 40-55%	154450	22464 [†]	20
Caelo	Glycerol monostearate 60	162338	22646	40
Caelo	Glycerol monostearate 60	162338	22741	40
Caelo	Glycerol monostearate 60	162338	22742	40
Caelo	Glycerol monostearate 60	162338	22744	40
Caelo	Sorbitan stearate	162352	22764	40

- 80 297 spectra from a total of 1927 batches from further 617 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 105 spectra from 64 *Apo-Ident* customers from 59 batches from the substance/substance group *Monostereates*.

Supplier	Substance	Batch	Spectra
Caelo	Glycerol monostearate 60	13109304	8
Caelo	Glycerol monostearate, self-...	13109405	2
Caelo	Glycerol monostearate, self-...	13109410	1
Caelo	Glycerol monostearate 40-55%	131156602	1
Caelo	Glycerol monostearate 40-55%	13221308	1
Caelo	Glycerol monostearate 60	14012002	4
Caelo	Glycerol monostearate 40-55%	14169701	1
Caelo	Glycerol monostearate 40-55%	14169710	1
Caelo	Glycerol monostearate 40-55%	14169717	2

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Glycerol monostearate, self-...	1420607	1
Gehe	Glycerol monostearate, self-...	14240605	2
Caelo	Glycerol monostearate, self-...	14240611	1
Caelo	Glycerol monostearate, self-...	14308310	1
Caelo	Glycerol monostearate 40-55%	15280903	1
Noweda	Glycerol monostearate, self-...	11079301	1
Caelo	Glycerol monostearate, self-...	11079308	1
Caelo	Glycerol monostearate 40-55%	12105729	1
Fagron	Glycerol monostearate 40-55%	12K05-N06	2
Caelo	Glycerol monostearate 40-55%	13156601	3
Caesar/Noweda	Glycerol monostearate 60	13109304	1
Spangropharm	Glycerol monostearate 40-55%	80402468	1
Anzag	Glycerol monostearate 60	12180502	1
Audor Pharma	Glycerol monostearate 60	13232604	1
Caelo	Glycerol monostearate 60	15009203	4
Noweda	Glycerol monostearate 60	15009203	1
Fagron	Glycerol monostearate 40-55%	7G19-N09	1
Caelo	Glycerol monostearate, self-...	16030301	1
Fagron	Glycerol monostearate 40-55%	12A27-N11	1
Caelo	Glycerol monostearate 60	13018201	3
Caesar & Loretz/Noweda	Glycerol monostearate 60	15009203	1
Caelo	Glycerol monostearate 60	1301821	1
Phonix	Glycerol monostearate 60	13109304	1
Caelo	Glycerol monostearate 40-55%	13221303	2
Fagron	Glycerol monostearate 40-55%	CG10980003	1
Caelo	Sorbitan stearate	13209409	1
Caelo	Sorbitan stearate	13209418	2
Caelo	Sorbitan stearate	13209417	3
Caelo	Sorbitan stearate	14038504	1
Caelo	Sorbitan stearate	13209419	2
Caelo	Sorbitan stearate	14038510	1
Caelo	Sorbitan stearate	14038511	1
Caelo	Sorbitan stearate	14218803	2
Caelo	Sorbitan stearate	14218804	1
Caelo	Sorbitan stearate	14218808	3
Fagron	Sorbitan stearate	14J07-B02-299399	1
Caelo	Sorbitan stearate	15300302	5
Caelo	Sorbitan stearate	14372803	1
Caelo	Sorbitan stearate	15415202	2
Caelo	Sorbitan stearate	11145411	1
Fagron	Sorbitan stearate	12E30-N14	1
Großhandel	Sorbitan stearate	12274801	1
Caelo	Sorbitan stearate	12h23-n05	1
Caelo	Sorbitan stearate	26031507	1
Caelo	Sorbitan stearate	12274813	2
Caelo	Sorbitan stearate	13209410	1
Phonix	Sorbitan stearate	13209418	1
Caelo	Sorbitan stearate	13B19-N01	1
Fagron	Sorbitan stearate	13B19-N01	2
Gehe 16.04.2013	Sorbitan stearate	13B19-N01	1
Fagron	Sorbitan stearate	13D10N10	1
Fagron	Sorbitan stearate	13D10-N10	1
Fagron	Sorbitan stearate	5052	1
Caelo	Sorbitan stearate	13209409	2
Caelo	Sorbitan stearate	15300308	1
Caelo	Sorbitan stearate	12085011	1
Caelo	Sorbitan stearate	12274801	1
Caelo	Sorbitan stearate	12274807	1
Nachprüfung	Sorbitan stearate		1

- 55 896 spectra from 335 *Apo-Ident* customers from a total of 20 554 batches from a further 680 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Monostereates* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Monostereates* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	910	0	74 968
Type B	0	732	319	80 297
Type C	0	92	13	55 896

The substance/substance group *Monostereates* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 99.3407 %)
Type B	100.0000 % (> 99.9853 %)	69.6480 % (> 69.3625 %)
Type C	100.0000 % (> 99.8622 %)	87.6190 % (> 84.7619 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20039	20039	0.00	39.72
20351	20351	0.00	32.08
20691	21446	11.51	39.39
20751	20751	0.00	34.91
20783	20751	2.47	34.91
20828	20351	12.56	36.44
20867	21446	17.07	39.24

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21093	21093	0.00	18.98
21437	21437	0.00	35.33
21446	21446	0.00	37.05
21576	21576	0.00	29.16
21585	21576	1.59	29.78
21885	21885	0.00	18.80
21982	22320	3.17	17.02
21993	20751	9.64	32.39
22277	21446	19.62	38.82
22320	22320	0.00	17.00
22464	22464	0.00	34.38
22623	22623	0.00	22.64
22667	20751	7.46	31.58
22743	22743	0.00	19.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Mupirocin calcium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20781-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Mupirocin calcium; Calcii mupirocini; Mupirocinum calcii

Special notes

When selecting the *Mupirocin calcium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Mupirocin calcium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Mupirocin calcium	12E02-N07	20781	40	1401556
Caelo	Mupirocin calcium	14276602	21745	40	20141103
Caelo	Mupirocin calcium	161184	22454	40	20160504*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Mupirocin calcium*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Mupirocin calcium*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Mupirocin calcium	14276602	21745 [†]	20
Caelo	Mupirocin calcium	161184	22454 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Mupirocin calcium*.

Supplier	Substance	Batch	Spectra
Caelo	Mupirocin calcium	83200301013	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Fagron	Mupirocin calcium	14B03-B30-299165	1
Fagron	Mupirocin calcium	14B03-B30-297291	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Mupirocin calcium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Mupirocin calcium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	2	1	55 998

The substance/substance group *Mupirocin calcium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20781	20781	0.00	50.99
21745	20781	11.52	51.89
22454	22454	0.00	51.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Naloxone hydrochloride dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20957-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Naloxone hydrochloride dihydrate; Naloxoni hydrochloridum dihydricum

Special notes

When selecting the *Naloxone hydrochloride dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Naloxone hydrochloride dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Naloxone hydroch...	13D22-N07	20957	40	1402059
Fagron	Naloxone hydroch...	13L12-B03	21271	40	20140113
Audor	Naloxone hydroch...	AP13501078IIN	22811	40	20160429
Caelo	Naloxone hydroch...	163577	23039	40	20170306*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Naloxone hydrochloride dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Naloxone hydrochloride dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Naloxone hydrochloride dihyd...	15322517	22828	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 5 *Apo-Ident* customers from 13 batches from the substance/substance group *Naloxone hydrochloride dihydrate*.

Supplier	Substance	Batch	Spectra
Fagron	Naloxone hydrochloride dihyd...	12G19-N02	1
Phönix	Naloxone hydrochloride dihyd...	13L12-B03-289511	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Naloxone hydrochloride dihyd...	13D22-N07	1
Fagron	Naloxone hydrochloride dihyd...	14F20-B02-296077	2
Audor Pharma	Naloxone hydrochloride dihyd...	AP13501078N	1
Fagron	Naloxone hydrochloride dihyd...	15B06-B02-304421	1
Fagron	Naloxone hydrochloride dihyd...	15E28-B01-308324	2
Fagron	Naloxone hydrochloride dihyd...	14F20-B02	1
Fagron	Naloxone hydrochloride dihyd...	15H04-B09	3
Fagron	Naloxone hydrochloride dihyd...	14A28-B33-296076	1
Fagron	Naloxone hydrochloride dihyd...	15K11-B05-319571	1
Fagron	Naloxone hydrochloride dihyd...	15B06-B02-304420	1
Fagron	Naloxone hydrochloride dihyd...	13L12-B03	3

- 55 982 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Naloxone hydrochloride dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naloxone hydrochloride dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	40	0	81 308
Type C	0	18	1	55 974

The substance/substance group *Naloxone hydrochloride dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20957	20957	0.00	32.62
21271	20957	5.48	35.83
22811	20957	14.22	35.94
23039	23039	0.00	37.88

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Naphazoline hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20899-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Naphazoline hydrochloride; Naphazolini hydrochloridum; Naphazolinum hydrochloricum

Special notes

When selecting the *Naphazoline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Naphazoline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Naphazoline hydr...	12375211	20899	40	20130108
Caelo	Naphazoline hydr...	12375211	21397	40	20130108
Caelo	Naphazoline hydr...	12375211	21398	40	20130108
Euro OTC	Naphazoline hydr...	1407034-01	21623	40	AR-15-FG-007847-01
Euro OTC	Naphazoline hydr...	1506015	21859	40	20150727*

Validation samples

A total of 213227 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 *Naphazoline hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75678 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Naphazoline hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Naphazoline hydrochloride	12375211	21397 [†]	20
Caelo	Naphazoline hydrochloride	12375211	21398 [†]	20
Euro OTC	Naphazoline hydrochloride	1407034-01	21623 [†]	20
Euro OTC	Naphazoline hydrochloride	1506015	21859 [†]	20
Euro OTC	Naphazoline hydrochloride	1607041	22753	40

- 81228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 57 spectra from 44 *Apo-Ident* customers from 36 batches from the substance/substance group *Naphazoline hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Naphazoline hydrochloride	60494000113K27-N04	1
Caelo	Naphazoline hydrochloride	11081107	2
Euro OTC	Naphazoline hydrochloride	1206037-02	3
Caelo	Naphazoline hydrochloride	12375211	1
Caelo	Naphazoline hydrochloride	1216203	1
Fagron	Naphazoline hydrochloride	13/03-B03-305291	1
Fagron	Naphazoline hydrochloride	13I03-B03	1
Fagron	Naphazoline hydrochloride	13A07-N06	4
Fagron	Naphazoline hydrochloride	13I03-B03-295105	2
Fagron	Naphazoline hydrochloride	13I03-B03-305291	2
Caelo	Naphazoline hydrochloride	13I03-B03-305291	1
Fagron	Naphazoline hydrochloride	13K27-N04	4
Fagron	Naphazoline hydrochloride	13k27-n04	1
Euro OTC	Naphazoline hydrochloride	14070034-01	1
Euro OTC	Naphazoline hydrochloride	1407034-01	1
Euro OTC	Naphazoline hydrochloride	1506015-01	1
Euro OTC	Naphazoline hydrochloride	1506015-02	2
Caelo	Naphazoline hydrochloride	15071404	1
Caelo	Naphazoline hydrochloride	9285103	3
Phönix	Naphazoline hydrochloride	586550002	1
Caleo /Herba	Naphazoline hydrochloride	9285103	1
Fagron	Naphazoline hydrochloride	11/05-N02	1
Anzag, 10.10.2012	Naphazoline hydrochloride	11081112	2
Caelo	Naphazoline hydrochloride	11081112	1
Fagron	Naphazoline hydrochloride	11K25-N03	1
Euro OTC	Naphazoline hydrochloride	113031-01	1
Fagron	Naphazoline hydrochloride	11I05-N02	2
Fagron	Naphazoline hydrochloride	11J13-N08	1
Caelo	Naphazoline hydrochloride	12176203	1
Fagron	Naphazoline hydrochloride	12K29-N01o256/310	1
Caelo	Naphazoline hydrochloride	1307020-02	1
Fagron	Naphazoline hydrochloride	13C11-N07	3
Caelo	Naphazoline hydrochloride	2275310	1
Fagron	Naphazoline hydrochloride	13C11N07	1
Fagron	Naphazoline hydrochloride	4309I-01885	1
Eurho/Phoenix	Naphazoline hydrochloride	4413I-01885	1
Caelo	Naphazoline hydrochloride	1206037	1
Fagron	Naphazoline hydrochloride	4509E-01885	1
Caelo	Naphazoline hydrochloride	12375203	1

- 55 944 spectra from 335 *Apo-Ident* customers from a total of 20 575 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Naphazoline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naphazoline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	120	0	81 228
Type C	0	57	0	55 944

The substance/substance group *Naphazoline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 89.4737 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20899	21623	8.11	46.03
21397	21859	1.84	54.63
21398	21623	3.13	46.55
21623	21623	0.00	48.76
21859	21859	0.00	51.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Naphazoline nitrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20501-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Naphazoline nitrate; Naphazolini nitras; Naphazolinum nitricum

Special notes

When selecting the *Naphazoline nitrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Naphazoline nitrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Naphazoline nitr...	11K21-N24	20501	39	AR-13-FG-001230-01
Fagron	Naphazoline nitr...	12L10-N03	20846	40	20121217
Fagron	Naphazoline nitr...	12J08-B40-287904	21808	40	20131129
Euro OTC	Naphazoline nitr...	1512033	22302	40	20160126*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 159 spectra of 4 reference samples from the substance/substance group *Naphazoline nitrate*. These samples are listed above in the [calibration samples](#) section.
- 75 719 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Naphazoline nitrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Naphazoline nitrate	12J08-B40-287904	21808 [†]	20
Euro OTC	Naphazoline nitrate	1512033	22302 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Naphazoline nitrate*.

Supplier	Substance	Batch	Spectra
Fagron	Naphazoline nitrate	12J08-B40-294166	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Fagron	Naphazoline nitrate	16A14-B03-322534	1
Fagron	Naphazoline nitrate	12J08B40-294166	1
Audor Pharma	Naphazoline nitrate	12I21-N05	1
Fagron	Naphazoline nitrate	21021304	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Naphazoline nitrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naphazoline nitrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	159	0	75 719
Type B	0	40	0	81 308
Type C	0	5	0	55 996

The substance/substance group *Naphazoline nitrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2264 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20501	20501	0.00	65.94
20846	22302	5.27	63.31
21808	22302	3.45	67.04
22302	22302	0.00	66.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Naproxen**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22316-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Naproxen; Naproxenum

Special notes

When selecting the *Naproxen* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Naproxen*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Naproxen	15F18-B03-309492	22316	30	AR-16-FG-008486-02
Fagron	Naproxen	15F18-B03-315691	22327	30	20150703

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 60 spectra of 2 reference samples from the substance/substance group *Naproxen*. These samples are listed above in the [calibration samples](#) section.
- 75 818 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 54 spectra of 3 reference samples from the substance/substance group *Naproxen*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Naproxen	15F18-B03-309492	22316 [†]	15
Fagron	Naproxen	15F18-B03-315691	22327 [†]	15
Fagron	Naproxen	16B04-B09-321569	not required	24

- 81 294 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Naproxen*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Naproxen* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Naproxen* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	60	0	75 818
Type B	0	54	0	81 294
Type C	0	0	0	56 001

The substance/substance group *Naproxen* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9889 %)	100.0000 % (> 90.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 88.8889 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22316	22316	0.00	46.89
22327	22316	0.80	46.62

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Neomycin sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20544-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Neomycin sulfate; Neomycin sulphate; Neomycini sulfas; Neomycinum sulfuricum

Special notes

When selecting the *Neomycin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Neomycin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Neomycin sulfate	11C13-N04	20544	40	20120320
Euro OTC	Neomycin sulfate	1303033-03	21771	40	AR-15-FG-016582-01
Caelo	Neomycin sulfate	13062923	21814	40	AR-15-FG-016581-01
Fagron	Neomycin sulfate	14C27-B05-302516	21894	40	1604527
Fagron	Neomycin sulfate	14C27-B05-302517	21961	40	20140418
Caelo	Neomycin sulfate	13062923	22276	30	20130315
Euro OTC	Neomycin sulfate	1601046	22381	30	20160212*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 260 spectra of 7 reference samples from the substance/substance group *Neomycin sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 618 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 355 spectra of 11 reference samples from the substance/substance group *Neomycin sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Neomycin sulfate	1102043-02	20758	40
Euro OTC	Neomycin sulfate	1303033-03	21771 [†]	20
Caelo	Neomycin sulfate	13062923	21814 [†]	20
Fagron	Neomycin sulfate	14C27-B05-302516	21894 [†]	20
Fagron	Neomycin sulfate	14C27-B05-302517	21961 [†]	20
Caelo	Neomycin sulfate	13062923	22276 [†]	15
Euro OTC	Neomycin sulfate	1601046	22381 [†]	15
Caelo	Neomycin sulfate	15237602	22389	40
Fagron	Neomycin sulfate	14C27-B05-302516	21894SI	60
Fagron	Neomycin sulfate	14C27-B05-302517	21961SI	60
Caelo	Neomycin sulfate	13062923	22276SI	45

- 80 993 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 213 spectra from 107 *Apo-Ident* customers from 68 batches from the substance/substance group *Neomycin sulfate*.

Supplier	Substance	Batch	Spectra
Caelo	Neomycin sulfate	9105308	1
Euro/phönix	Neomycin sulfate	1502004-01	1
Euro OTC	Neomycin sulfate	1502004-01	8
Caelo	Neomycin sulfate	9051402	1
Caelo	Neomycin sulfate	13062923	3
Caelo	Neomycin sulfate	10157505	7
Euro OTC	Neomycin sulfate	1102043-02	12
Caelo	Neomycin sulfate	12276410	2
Noweda	Neomycin sulfate	1102043-02	1
Fagron	Neomycin sulfate	12H23-N04	5
Euro OTC	Neomycin sulfate	130033-03	1
Euro OTC	Neomycin sulfate	1303033-01	9
Phönix	Neomycin sulfate	1303033-02	1
Euro OTC	Neomycin sulfate	1303033-02	11
Pfizer USA / Phönix	Neomycin sulfate	1303033-02	1
Euro OTC	Neomycin sulfate	1303033-03	13
Gehe	Neomycin sulfate	1303033-03	1
phoenix 13.11.14	Neomycin sulfate	1303033-03	1
Caelo	Neomycin sulfate	13062905	1
Caelo	Neomycin sulfate	13062908	1
Land/Phönix	Neomycin sulfate	13062905	2
Caelo	Neomycin sulfate	13062922	1
Caelo	Neomycin sulfate	13D10N05	1
	Neomycin sulfate	13G09-N07	1
Fagron	Neomycin sulfate	13G09-N07	11
Fagron	Neomycin sulfate	13G09N07	2
Fagron	Neomycin sulfate	13K15-B33-288073	3
Fagron	Neomycin sulfate	13K15-B33-288069	3
Fagron	Neomycin sulfate	14A31B02	2
Fagron	Neomycin sulfate	14A31-B02	2
Fagron	Neomycin sulfate	14A31B02294696	1
Fagron	Neomycin sulfate	14A31-B02-294696	3
Caelo	Neomycin sulfate	14A31-B02-294696	1
AHD	Neomycin sulfate	14A31-B02-294698	2
fargron	Neomycin sulfate	14A31-B02-294698	1
Fagron	Neomycin sulfate	14A31-B02-294698	1
Fagron	Neomycin sulfate	14C27-B05	1
Fagron	Neomycin sulfate	14A31-B02-302519	1
Euro/Phönix	Neomycin sulfate	1502004-01	1
Jenne	Neomycin sulfate	15237602	1
Caelo	Neomycin sulfate	15237602	1
Caelo	Neomycin sulfate	15298902	1
Noweda	Neomycin sulfate	15298902	1
Fagron	Neomycin sulfate	15J09-B04314015	1
Fagron	Neomycin sulfate	15J09-B04	1
Caesar&Loretz/Noweda	Neomycin sulfate	15298904	1
Fagron	Neomycin sulfate	15J09-B04-314015	1
Fagron	Neomycin sulfate	15J09-B04-314017	1
Euro OTC	Neomycin sulfate	1601046-01	4
Fagron	Neomycin sulfate	15J27-B07	1
Cealo/AHD	Neomycin sulfate	15J09-B04-314017	1
Euro OTC	Neomycin sulfate	160104601	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Neomycin sulfate	16019046-01	1
Caelo	Neomycin sulfate	16122601	1
siehe WE-Prüfprotokoll	Neomycin sulfate	19/12	1
Fagron	Neomycin sulfate	4312I-01926	1
Caelo	Neomycin sulfate	5/AKD36	1
Euro OTC	Neomycin sulfate	G73890	1
Fagron	Neomycin sulfate	F08469	1
Caelo	Neomycin sulfate	9105316	1
Caelo	Neomycin sulfate	16122612	1
Caelo	Neomycin sulfate	563313062905	1
Fagron	Neomycin sulfate	10121-N01	1
Gehe	Neomycin sulfate	194A-01926	1
Caesar & Loretz GmbH, 4...	Neomycin sulfate	11/19-N14	1
Fagron	Neomycin sulfate	11/19-N14	5
AHD	Neomycin sulfate	11/19-N14	1
Euro OTC	Neomycin sulfate	1102043	2
Euro OTC	Neomycin sulfate	1102043-01	2
Caelo	Neomycin sulfate	1102043-02	1
Gehe	Neomycin sulfate	1102043-02	1
Euro OTC	Neomycin sulfate	1102043-03	4
Alliance Healthcare	Neomycin sulfate	1102043-03	1
aurica/phoenix	Neomycin sulfate	1102043-02	1
EuRho	Neomycin sulfate	1102043-02	1
Anzag 13.06.2013	Neomycin sulfate	1102043-03	1
Caelo	Neomycin sulfate	1102043-03	2
Fagron	Neomycin sulfate	11C21-N10	1
Caelo	Neomycin sulfate	11C21-N10	1
EuRho/Sanacorp	Neomycin sulfate	1102043-03	1
Caelo	Neomycin sulfate	12175401	5
Caelo	Neomycin sulfate	12276405	3
Phönix Gotha	Neomycin sulfate	12C13-N04	1
Caesar&lorenz,Phoenix	Neomycin sulfate	12C13-N04	1
Fagron	Neomycin sulfate	12C13-N04	4
Anzag	Neomycin sulfate	12H20-N04	1
Caelo	Neomycin sulfate	12H23-N04	1
Fagron	Neomycin sulfate	12I19-N14	1
Alliance Health 13.01.204	Neomycin sulfate	1303033-01	2
phnoix	Neomycin sulfate	130303301	1
Ashland/Sanacorp	Neomycin sulfate	1303033-02	1
Caelo	Neomycin sulfate	1303033-02	1
Fagron	Neomycin sulfate	13D10-N05	7
Phönix	Neomycin sulfate	13D10-N05	1
Fagron	Neomycin sulfate	13D10-N05	1
Fagron	Neomycin sulfate	13G09-N06	1
Caelo	Neomycin sulfate	13G09-N07	1
Fagron	Neomycin sulfate	13G09-N070129/340	1
Caelo	Neomycin sulfate	5/AKD35	1
Caelo	Neomycin sulfate	24111203	1
Gehe	Neomycin sulfate	183360-0009	1
Caelo	Neomycin sulfate	12276415	1

- 55 788 spectra from 335 *Apo-Ident* customers from a total of 20 544 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Neomycin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neomycin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	260	0	75 618
Type B	0	290	65	80 993
Type C	0	204	9	55 788

The substance/substance group *Neomycin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.6923 %)
Type B	100.0000 % (> 99.9853 %)	81.6901 % (> 80.8451 %)
Type C	100.0000 % (> 99.8622 %)	95.7746 % (> 94.3662 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20544	21894	9.76	29.98
21771	21771	0.00	30.67
21814	21814	0.00	29.70
21894	21894	0.00	50.54
21961	21771	6.63	33.61
22276	21814	4.03	27.58
22381	22381	0.00	33.14

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Neostigmine bromide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20717-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Neostigmine bromide; Neostigmini bromidum

Special notes

When selecting the *Neostigmine bromide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Neostigmine bromide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Neostigmine brom...	10144105	20717	40	20100616
Caelo	Neostigmine brom...	12172304	20990	40	1403163
Caelo	Neostigmine brom...	14256802	21816	40	AR-15-FG-014460-01
Caelo	Neostigmine brom...	15228101	21919	40	20151002
Caelo	Neostigmine brom...	14256802	21816SI	40	AR-15-FG-014460-01
Caelo	Neostigmine brom...	15228101	21919SI	40	20151002

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Neostigmine bromide*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Neostigmine bromide*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Neostigmine bromide	14256802	21816 [†]	20
Caelo	Neostigmine bromide	15228101	21919 [†]	20
Caelo	Neostigmine bromide	14256802	21816SI [†]	20
Caelo	Neostigmine bromide	15228101	21919SI [†]	20

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Neostigmine bromide*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Neostigmine bromide	13177206	4
Caelo	Neostigmine bromide	13177203	2
Caelo	Neostigmine bromide	131772303B	1
Caelo	Neostigmine bromide	131772303A	1
Gehe	Neostigmine bromide	12172301	1
Caelo	Neostigmine bromide	12172301	1
Caelo	Neostigmine bromide	14256802	1
Caelo	Neostigmine bromide	12172304	1
Gehe	Neostigmine bromide	13177201	1
Gehe	Neostigmine bromide	12172307	1

- 55 987 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Neostigmine bromide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Neostigmine bromide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	80	0	81 268
Type C	0	14	0	55 987

The substance/substance group *Neostigmine bromide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20717	20990	4.72	53.51
20990	20990	0.00	53.10
21816	21816	0.00	49.12
21919	21816	4.17	51.65

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Nicotinamide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20335-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Nicotinamide; Nicotinamidum; Nicotinoylamidum

Special notes

When selecting the *Nicotinamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Nicotinamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Nicotinamide	10L21-N09	20335	40	AR-12-FG-009255-01
Caelo	Nicotinamide	13097506	21364	40	20130416
Euro OTC	Nicotinamide	1310025-01	21643	40	20131121
Euro OTC	Nicotinamide	1511010	22251	40	20151203*
Euro OTC	Nicotinamide	1601045	22374	40	20160210*
Euro OTC	Nicotinamide	1610019	22874	40	20161202*
Caelo	Nicotinamide	163048	23050	40	20161123*

Validation samples

A total of 213 227 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 *Nicotinamide*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 400 spectra of 11 reference samples from the substance/substance group *Nicotinamide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Nicotinamide	L11060228	20388	40
Caelo	Nicotinamide	11001803	20399	40
Euro OTC	Nicotinamide	1003025-03	20407	40
Euro OTC	Nicotinamide	1108021-01	20577	40
Caelo	Nicotinamide	11001809	20647	40
Euro OTC	Nicotinamide	1310025-01	21643 [†]	20
Euro OTC	Nicotinamide	1511010	22251 [†]	20
Euro OTC	Nicotinamide	1601045	22374 [†]	20
Caelo	Nicotinamide	161136	22434	60
Caelo	Nicotinamide	161136	22625	40
Caelo	Nicotinamide	163048	23038	40

- 80 948 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 34 spectra from 18 *Apo-Ident* customers from 22 batches from the substance/substance group *Nicotinamide*.

Supplier	Substance	Batch	Spectra
Euro OTC	Nicotinamide	11401052	1
Fagron	Nicotinamide	12J02-B03	1
Phoenix	Nicotinamide	1211031-02	1
Caelo	Nicotinamide	13097504	1
Euro OTC	Nicotinamide	1310025-01	4
Euro OTC	Nicotinamide	131002501	1
Euro OTC	Nicotinamide	1408019-01	4
Caelo	Nicotinamide	13352002	1
Caelo	Nicotinamide	14246806	1
Euro OTC	Nicotinamide	1503024-01	1
Euro OTC	Nicotinamide	1511010-01	1
Euro OTC	Nicotinamide	1108021-01	1
Fagron	Nicotinamide	10L21-N09	1
Fagron	Nicotinamide	L14020084	1
DSM Nutritional Prod./ ...	Nicotinamide	1106044-01	1
Euro OTC	Nicotinamide	1108021-02	1
Euro OTC	Nicotinamide	1211031-01	2
Euro OTC	Nicotinamide	1211031-02	1
Noweda	Nicotinamide	12133403	2
Euro OTC	Nicotinamide	11208021	1
Caelo	Nicotinamide	12133403	1
Gatt-Koller	Nicotinamide	221406112411	1
Caelo	Nicotinamide	12268302	1
Gatt-Koller	Nicotinamide	4456/10104110	1
Euro OTC	Nicotinamide	1106044-01	2

- 55 967 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Nicotinamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Nicotinamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	390	10	80 948
Type C	0	33	1	55 967

The substance/substance group *Nicotinamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	97.5000 % (> 96.7500 %)
Type C	100.0000 % (> 99.8622 %)	97.0588 % (> 88.2353 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20335	20335	0.00	61.88
21364	22251	4.87	62.07
21643	22374	2.15	61.39
22251	22251	0.00	61.94
22374	22374	0.00	60.97
22874	22874	0.00	61.77
23050	23050	0.00	62.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Nicotinic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20383-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Nicotinic acid; Acidum nicotinicum

Special notes

When selecting the *Nicotinic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Nicotinic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Nicotinic acid	L10070324	20383	40	AR-13-FG-000246-01
Fagron	Nicotinic acid	14E01-B09-293947	21692	40	AR-15-FG-008938-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Nicotinic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Nicotinic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Nicotinic acid	14E01-B09-293947	21692 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Nicotinic acid*.

Supplier	Substance	Batch	Spectra
AppliChem	Nicotinic acid	2Q006387	1
Fagron	Nicotinic acid	14E01-B09	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Nicotinic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Nicotinic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	2	0	55 999

The substance/substance group *Nicotinic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20383	20383	0.00	92.09
21692	21692	0.00	89.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Nitrofurantoin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20698-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Nitrofurantoin; Nitrofurantoinum

Special notes

When selecting the *Nitrofurantoin* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Nitrofurantoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Nitrofurantoin	12C30-N03	20698	40	1401461
Fagron	Nitrofurantoin	11K-21-N23	20836	40	20111128
Fagron	Nitrofurantoin	12C30-N03	20837	40	20120417
Fagron	Nitrofurantoin	13B28-N07	21091	40	20130304
Fagron	Nitrofurantoin	11I07-N11	21273	40	20110829
Fagron	Nitrofurantoin	15J15-B06-315225	22257	40	AR-16-FG-003763-01
Fagron	Nitrofurantoin	15J15-B06-315225	22322	40	20151028

Validation samples

A total of 213 227 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 *Nitrofurantoin*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Nitrofurantoin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Nitrofurantoin	14G25-B04-296785	21693	60
Fagron	Nitrofurantoin	15J15-B06-315225	22257 [†]	20
Fagron	Nitrofurantoin	15J15-B06-315225	22322 [†]	20

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 *Apo-Ident* customers from 12 batches from the substance/substance group *Nitrofurantoin*.

[†]These spectra were recorded from 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
Fagron	Nitrofurantoin	71/14	1
Fagron	Nitrofurantoin	3071403	1
Fagron	Nitrofurantoin	11F07-N06	1
Fagron	Nitrofurantoin	13B28-N07	1
Fagron	Nitrofurantoin	13A08-N01	1
Fagron	Nitrofurantoin	15J15-B06	1
Fagron	Nitrofurantoin	13D10-N03	1
Apotheke am Lindenhof	Nitrofurantoin	15J15-B06	1
Fagron	Nitrofurantoin	15J15-B06-315225	1
Fagron	Nitrofurantoin	15J15-B06-313939	1
Fagron	Nitrofurantoin	201203080296	1
Fagron	Nitrofurantoin	27141I-03527	1
Fagron	Nitrofurantoin	12C30-N03	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Nitrofurantoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Nitrofurantoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 598
Type B	0	40	60	81 248
Type C	0	12	1	55 988

The substance/substance group *Nitrofurantoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	40.0000 % (> 37.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20698	20698	0.00	66.27
20836	20698	7.66	65.33
20837	20698	6.41	65.07
21091	22257	11.59	83.03
21273	20698	12.10	66.09
22257	22257	0.00	77.45
22322	22257	3.21	76.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Non-ionic emulsifying alcohol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20467-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Non-ionic emulsifying alcohol; Alcoholes emulsificantes nonionici

Special notes

When selecting the *Non-ionic emulsifying alcohol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Non-ionic emulsifying alcohol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Bombastus	Non-ionic emulsi...	00267575	20467	40	20111123
Caelo	Non-ionic emulsi...	13413001	21069	40	1405257
Caelo	Non-ionic emulsi...	13413001	21524	40	20140116

Validation samples

A total of 213 227 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 *Non-ionic emulsifying alcohol*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 90 spectra of 2 reference samples from the substance/substance group *Non-ionic emulsifying alcohol*.

Supplier	Substance	Batch	Sample ID	Spectra
Bombastus	Non-ionic emulsifying alcohol	238393	20183	50
Caelo	Non-ionic emulsifying alcohol	162231	22745	40

- 81 258 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 *Apo-Ident* customers from 7 batches from the substance/substance group *Non-ionic emulsifying alcohol*.

Supplier	Substance	Batch	Spectra
Euro OTC	Non-ionic emulsifying alcohol	278281	2
Bombastus	Non-ionic emulsifying alcohol	267575	3
Bombastus	Non-ionic emulsifying alcohol	284009	2
Bombastus	Non-ionic emulsifying alcohol	292319	1
Caelo	Non-ionic emulsifying alcohol	12254402	1
Caelo	Non-ionic emulsifying alcohol	21091302	1
Bombastus	Non-ionic emulsifying alcohol	274059	1

- 55 990 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Non-ionic emulsifying alcohol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Non-ionic emulsifying alcohol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	90	0	81 258
Type C	0	11	0	55 990

The substance/substance group *Non-ionic emulsifying alcohol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 93.3333 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20467	21069	13.61	34.67
21069	21069	0.00	26.78
21524	21069	8.12	23.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Norethisterone acetate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20797-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Norethisterone acetate; Norethisteroni acetat; Norethisteronum aceticum

Special notes

When selecting the *Norethisterone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Norethisterone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Norethisterone a...	12L14-N03	20797	40	1401558
Euro OTC	Norethisterone a...	1306033-01	21627	20	1511684

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 60 spectra of 2 reference samples from the substance/substance group *Norethisterone acetate*. These samples are listed above in the [calibration samples](#) section.
- 75 818 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Norethisterone acetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Norethisterone acetate	11C10-N03	20230	40
Euro OTC	Norethisterone acetate	1306033-01	21627 [†]	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Norethisterone acetate*.

Supplier	Substance	Batch	Spectra
Bombastus	Norethisterone acetate	13J08-N04	1
Fagron	Norethisterone acetate	14d08-b01-292736	1
Fagron	Norethisterone acetate	13J08-N04	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Norethisterone acetate	13J08-N04	1
Fagron	Norethisterone acetate	14h29-b03-310697	1
Fagron	Norethisterone acetate	23071509	1
Fagron	Norethisterone acetate	10L22-N01	1
Fagron	Norethisterone acetate	11H22-N03	2
Fagron	Norethisterone acetate	12C06-N10	2
Fagron	Norethisterone acetate	22061206	1
Fagron	Norethisterone acetate	13D19-No6	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Norethisterone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Norethisterone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	60	0	75 818
Type B	0	80	0	81 268
Type C	0	13	0	55 988

The substance/substance group *Norethisterone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9889 %)	100.0000 % (> 90.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20797	20797	0.00	12.88
21627	21627	0.00	10.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Octenidine dihydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20759-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Octenidine dihydrochloride; Octenidini dihydrochloridum

Special notes

When selecting the *Octenidine dihydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Octenidine dihydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Octenidine dihyd...	12115202	20759	40	20120511
Caelo	Octenidine dihyd...	13071407	20988	40	1407345
Caelo	Octenidine dihyd...	13166806	21331	40	20130718
Caelo	Octenidine dihyd...	15275502	21888	40	20150910
Caelo	Octenidine dihyd...	15356601	21947	40	1604116

Validation samples

A total of 213 227 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 *Octenidine dihydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 220 spectra of 5 reference samples from the substance/substance group *Octenidine dihydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Octenidine dihydrochloride	15275502	21888 [†]	20
Caelo	Octenidine dihydrochloride	15356601	21947 [†]	20
Caelo	Octenidine dihydrochloride	160330	22485	60
Caelo	Octenidine dihydrochloride	15275502	21888SI	60
Caelo	Octenidine dihydrochloride	15356601	21947SI	60

- 81 128 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 37 spectra from 23 *Apo-Ident* customers from 23 batches from the substance/substance group *Octenidine dihydrochloride*.

[†]These spectra were recorded from 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
Löwen City-Apotheke Bar...	Octenidine dihydrochloride	2042015	1
Caelo	Octenidine dihydrochloride	816M-03732	1
Caelo	Octenidine dihydrochloride	13166810	1
Caelo	Octenidine dihydrochloride	13166808	2
Caelo	Octenidine dihydrochloride	15006202	3
Caelo	Octenidine dihydrochloride	15006207	3
Apomix/Noweda	Octenidine dihydrochloride	13166813	1
Caesar & Loretz GmbH	Octenidine dihydrochloride	15006210	1
Caelo	Octenidine dihydrochloride	15275502	2
Caelo	Octenidine dihydrochloride	1515E-03732	1
Caelo	Octenidine dihydrochloride	15275503	2
Caelo	Octenidine dihydrochloride	15275504	1
Caelo	Octenidine dihydrochloride	15356601	2
Caelo	Octenidine dihydrochloride	15356603	1
Caelo	Octenidine dihydrochloride	16032803	2
Caelo	Octenidine dihydrochloride	16032909	1
Caelo	Octenidine dihydrochloride	15356703	3
Caelo	Octenidine dihydrochloride	16033001	2
Caelo	Octenidine dihydrochloride	16032910	2
Caelo	Octenidine dihydrochloride	16033002	1
Caelo	Octenidine dihydrochloride	16302910	1
Caelo	Octenidine dihydrochloride	16325304	2
Caelo	Octenidine dihydrochloride	16325305	1

- 55 964 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Octenidine dihydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Octenidine dihydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	220	0	81 128
Type C	0	36	1	55 964

The substance/substance group *Octenidine dihydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8622 %)	97.2973 % (> 89.1892 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20759	20988	5.19	28.50
20988	20988	0.00	27.80
21331	21947	6.02	29.87
21888	21947	4.01	34.91
21947	21947	0.00	30.61

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ofloxacin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21047-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ofloxacin; Ofloxacinum

Special notes

When selecting the *Ofloxacin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ofloxacin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ofloxacin	13A17-N01	21047	40	1403155
Fagron	Ofloxacin	13A17-N01	21052	40	20130123
Fagron	Ofloxacin	13A17-N01	21811	40	pending
Fagron	Ofloxacin	15H19-B01-312926	21918	40	20151006

Validation samples

A total of 213 227 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 *Ofloxacin*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Ofloxacin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ofloxacin	13A17-N01	21811 [†]	20
Fagron	Ofloxacin	15H19-B01-312926	21918 [†]	20
Fagron	Ofloxacin	13A17-N01	21811SI	60
Fagron	Ofloxacin	15H19-B01-312926	21918SI	60

- 81 188 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ofloxacin*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oxfloxacin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxfloxacin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 718
Type B	0	148	12	81 188
Type C	0	0	0	56 001

The substance/substance group *Oxfloxacin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	92.5000 % (> 90.6250 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21047	21047	0.00	18.30
21052	21047	2.33	17.40
21811	21811	0.00	29.36
21918	21811	3.58	26.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Omeprazole**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21098-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Omeprazole; Omeprazolum

Special notes

When selecting the *Omeprazole* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Omeprazole*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Molekular	Omeprazole	150908	21098	40	1405656
Inresa	Omeprazole	0PFP14017	21787	40	1507407
Inresa	Omeprazole	0PFP14017	21796	40	20140228
Inresa	Omeprazole	0PFP14017	22284	40	20140528
Fagron	Omeprazole	15K12-B02-314608	22890	40	20151124

Validation samples

A total of 213 227 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 *Omeprazole*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Omeprazole*.

Supplier	Substance	Batch	Sample ID	Spectra
Inresa	Omeprazole	OPFP14017	21787 [†]	20
Inresa	Omeprazole	OPFP14017	21796 [†]	20
Inresa	Omeprazole	OPFP14017	22284 [†]	20
Fagron	Omeprazole	15K12-B02-314608	22740	40

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Omeprazole*.

Supplier	Substance	Batch	Spectra
Fagron	Omeprazole	15K12-B02-314608	1
Fagron	Omeprazole	15B26-B40-305669	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Omeprazole* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Omeprazole* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	100	0	81 248
Type C	0	2	0	55 999

The substance/substance group *Omeprazole* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21098	21098	0.00	49.43
21787	21787	0.00	48.74
21796	21098	2.47	49.15
22284	21787	3.62	49.51
22890	21787	3.09	48.67

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ornithine aspartate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20842-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ornithine aspartate; Ornithini aspartas; Ornithinum asparticum

Special notes

When selecting the *Ornithine aspartate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ornithine aspartate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ornithine aspart...	L1304034-01	20842	40	1402571
Fagron	Ornithine aspart...	14A20-B07-296093	21694	30	1506279
Euro OTC	Ornithine aspart...	1312030-01	21710	40	1506280
Fagron	Ornithine aspart...	14I24-B04-307758	22600	40	20141110
Euro OTC	Ornithine aspart...	1611018	22924	40	20161213*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Ornithine aspartate*. These samples are listed above in the [calibration samples](#) section.
- 75 688 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Ornithine aspartate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ornithine aspartate	L1107045-01	20439	40
Fagron	Ornithine aspartate	14A20-B07-296093	21694 [†]	15
Euro OTC	Ornithine aspartate	1312030-01	21710 [†]	20
Fagron	Ornithine aspartate	14I24-B04-307758	22599	40

- 81 233 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Ornithine aspartate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Ornithine aspartate	1501049-01	1
Euro OTC	Ornithine aspartate	L-1304034-01	1
Euro OTC	Ornithine aspartate	L1304034-01	2

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ornithine aspartate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ornithine aspartate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	190	0	75 688
Type B	0	75	40	81 233
Type C	0	1	3	55 997

The substance/substance group *Ornithine aspartate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8421 %)
Type B	100.0000 % (> 99.9853 %)	65.2174 % (> 62.6087 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20842	20842	0.00	62.45
21694	21694	0.00	41.29

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21710	21710	0.00	37.91
22600	21710	10.07	37.22
22924	22924	0.00	36.13

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ornithine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20389-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ornithine hydrochloride; Ornithini hydrochloridum; Ornithinum hydrochloricum

Special notes

When selecting the *Ornithine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ornithine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Ornithine hydroc...	L11050156	20389	40	20110519
Fagron	Ornithine hydroc...	13A03-N05	20967	40	1403094
Euro OTC	Ornithine hydroc...	1307028-01	21622	80	20130813
Euro OTC	Ornithine hydroc...	1605011	22573	40	20160601*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 4 reference samples from the substance/substance group *Ornithine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 3 reference samples from the substance/substance group *Ornithine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ornithine hydrochloride	1307028-01	21622 [†]	40
Euro OTC	Ornithine hydrochloride	1612009	22923	40
Euro OTC	Ornithine hydrochloride	1612009-01	23009	40

- 81 228 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 batches from the substance/substance group *Ornithine hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Ornithine hydrochloride	13/23-No5	1
Fagron	Ornithine hydrochloride	15A13-B03	1
unbekannt	Ornithine hydrochloride	15000639	1
Fagron	Ornithine hydrochloride	13A03-N05	1
Euro OTC	Ornithine hydrochloride	315E-03475	1
Euro OTC	Ornithine hydrochloride	516Q-03475	1
Euro OTC	Ornithine hydrochloride	4712A-03475	1
Euro OTC	Ornithine hydrochloride	1014I-03475	1

- 55 993 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ornithine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ornithine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	120	0	81 228
Type C	0	8	0	55 993

The substance/substance group *Ornithine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20389	20967	6.51	53.64
20967	20967	0.00	53.34
21622	20967	2.80	53.14
22573	22573	0.00	53.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Oxalic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20458-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Oxalic acid; Acidum oxalicum cryst.

Special notes

When selecting the *Oxalic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Oxalic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Oxalic acid	11372701	20458	40	20120112
Caelo	Oxalic acid	13353901	21042	40	20131029
Caelo	Oxalic acid	12212410	21066	40	1403223
Caelo	Oxalic acid	12147007	21068	40	1405523
Caelo	Oxalic acid	13353918	21774	40	20131029
Caelo	Oxalic acid	153999	22488	40	nicht verfügbar*

Validation samples

A total of 213 227 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 *Oxalic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 5 reference samples from the substance/substance group *Oxalic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Oxalic acid	11098216	20462	40
Caelo	Oxalic acid	13353905	21453	60
Caelo	Oxalic acid	13353918	21774 [†]	20
Caelo	Oxalic acid	160502	22487	60
Caelo	Oxalic acid	153999	22488 [†]	20

- 81 148 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 19 spectra from 16 *Apo-Ident* customers from 18 batches from the substance/substance group *Oxalic acid*.

Supplier	Substance	Batch	Spectra
Caelo	Oxalic acid	914E-01039	1
Noweda	Oxalic acid	12212402	1
Caelo	Oxalic acid	10383104	1
Caelo	Oxalic acid	12212411	1
Caelo	Oxalic acid	12212407	1
Caelo	Oxalic acid	12212406	1
Caelo	Oxalic acid	13195408	1
Caelo	Oxalic acid	13195414	1
Caelo	Oxalic acid	13353901	1
Caelo	Oxalic acid	13353905	2
Caelo	Oxalic acid	13353907	1
Caelo	Oxalic acid	4812U-01039	1
Caesar&Loretz GmbH/ All...	Oxalic acid	13353920	1
Caelo	Oxalic acid	13353915	1
Caelo	Oxalic acid	13353910	1
sanacorp	Oxalic acid	11098213	1
Caelo	Oxalic acid	12147010	1
Nachprüfung	Oxalic acid		1

- 55 982 spectra from 335 *Apo-Ident* customers from a total of 20 594 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oxalic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxalic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	199	1	81 148
Type C	0	19	0	55 982

The substance/substance group *Oxalic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	99.5000 % (> 98.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20458	21066	4.28	61.63
21042	21066	4.39	73.07
21066	21066	0.00	61.99
21068	21068	0.00	43.00
21774	21066	3.26	64.72
22488	22488	0.00	38.48

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Oxybuprocaine hydrochloride
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20958-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxybuprocaine hydrochloride; Oxybuprocaini hydrochloridum; Oxybuprocainum hydrochloricum

Special notes

When selecting the *Oxybuprocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Oxybuprocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Oxybuprocaine hy...	13D16-N12	20958	40	1402060
Fagron	Oxybuprocaine hy...	13J24-B07-295015	21799	40	AR-15-FG-014812-02
Fagron	Oxybuprocaine hy...	15A26-B07-306787	21922	40	20150203

Validation samples

A total of 213 227 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 *Oxybuprocaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 200 spectra of 5 reference samples from the substance/substance group *Oxybuprocaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Oxybuprocaine hydrochloride	pending	20159	40
Fagron	Oxybuprocaine hydrochloride	13J24-B07-295015	21799 [†]	20
Fagron	Oxybuprocaine hydrochloride	15A26-B07-306787	21922 [†]	20
Fagron	Oxybuprocaine hydrochloride	13J24-B07-295015	21799SI	60
Fagron	Oxybuprocaine hydrochloride	15A26-B07-306787	21922SI	60

- 81 148 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Oxybuprocaine hydrochloride*.

[†]These spectra were recorded from 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
Fagron	Oxybuprocaine hydrochloride	13C01-N01	4
Fagron	Oxybuprocaine hydrochloride	12L19N01	1
Fagron	Oxybuprocaine hydrochloride	13J24B07295015	1
Fagron	Oxybuprocaine hydrochloride	13H13-N050001/18	1
Caelo	Oxybuprocaine hydrochloride	14G21B02300384	1
Fagron	Oxybuprocaine hydrochloride	13h13-n05	2
Klenk	Oxybuprocaine hydrochloride	3613M-07321	1
Fagron	Oxybuprocaine hydrochloride	3613N-07321	1
Fagron	Oxybuprocaine hydrochloride	4612M-03639	2

- 55 987 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oxybuprocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxybuprocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	166	34	81 148
Type C	0	12	2	55 987

The substance/substance group *Oxybuprocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	83.0000 % (> 81.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20958	20958	0.00	20.94
21799	21799	0.00	18.47
21922	20958	9.16	20.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Oxybutynin hydrochloride
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20565-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxybutynin hydrochloride; Oxybutynini hydrochloridum; Oxybutyninum hydrochloricum

Special notes

When selecting the *Oxybutynin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Oxybutynin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Oxybutynin hydro...	12D24-N07	20565	80	1402305
Fagron	Oxybutynin hydro...	13H26-B03-290572	21543	40	AR-15-FG-002173-01
Fagron	Oxybutynin hydro...	14A29-B09-293841	21704	30	20140227

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 3 reference samples from the substance/substance group *Oxybutynin hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 728 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 3 reference samples from the substance/substance group *Oxybutynin hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Oxybutynin hydrochloride	13H26-B03-290572	21543 [†]	20
Fagron	Oxybutynin hydrochloride	14A29-B09-293841	21704 [†]	15
Fagron	Oxybutynin hydrochloride	14I16-B03-312059	22732	40

- 81 273 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Oxybutynin hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Oxybutynin hydrochloride	13H26-B03	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
Fagron	Oxybutynin hydrochloride	15F05-b03-315220	1
Fagron	Oxybutynin hydrochloride	14/16-B03-300207	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oxybutynin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxybutynin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	75 728
Type B	0	75	0	81 273
Type C	0	3	0	55 998

The substance/substance group *Oxybutynin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20565	20565	0.00	14.01
21543	21543	0.00	13.04
21704	21543	3.55	14.25

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Oxytetracycline hydrochloride
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20090-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Oxytetracycline hydrochloride; Oxytetracyclini hydrochloridum; Oxytetracyclinum hydrochloricum

Special notes

When selecting the *Oxytetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Oxytetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Oxytetracycline ...	12130001	20847	40	20120530
Fagron	Oxytetracycline ...	13D08-N11	20848	60	20110131
Caelo	Oxytetracycline ...	12328103	21039	40	20121214
Euro OTC	Oxytetracycline ...	1306022-02	21600	40	1507542
Euro OTC	Oxytetracycline ...	1506037	21836	40	20150721*
Fagron	Oxytetracycline ...	15D29-B99-309066	21915	40	20150522

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Oxytetracycline ...	1506037	21999	40	20150721*
Caelo	Oxytetracycline ...	16077002	22503	40	AR-16-FG-011460-01
Euro OTC	Oxytetracycline ...	1602025	22546	40	20160609*
Euro OTC	Oxytetracycline ...	1602025-01	22658	40	AR-16-FG-014422-01
Euro OTC	Oxytetracycline ...	1602025	22669	40	20160609*
Euro OTC	Oxytetracycline ...	1602025-02	22839	40	20161021

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 500 spectra of 12 reference samples from the substance/substance group *Oxytetracycline hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 378 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 6 reference samples from the substance/substance group *Oxytetracycline hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Oxytetracycline hydrochloride	12130001	20847 [†]	20
Euro OTC	Oxytetracycline hydrochloride	1306022-02	21600 [†]	20
Euro OTC	Oxytetracycline hydrochloride	1506037	21836 [†]	20
Fagron	Oxytetracycline hydrochloride	15D29-B99-309066	21915 [†]	20
Euro OTC	Oxytetracycline hydrochloride	1506037	21999 [†]	20
Euro OTC	Oxytetracycline hydrochloride	1602025-02	22846	40

- 81 208 spectra from a total of 1942 batches from further 620 substances. These spectra were

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 236 spectra from 96 *Apo-Ident* customers from 70 batches from the substance/substance group *Oxytetracycline hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Oxytetracycline hydrochloride	5041402	1
Fagron	Oxytetracycline hydrochloride	912A-02865	1
Euro OTC	Oxytetracycline hydrochloride	1205028-02	16
Caelo	Oxytetracycline hydrochloride	12091405	1
Euro OTC	Oxytetracycline hydrochloride	1205028	1
Caelo	Oxytetracycline hydrochloride	12328107	1
Caelo	Oxytetracycline hydrochloride	12328103	2
Euro OTC	Oxytetracycline hydrochloride	1306022-01	19
Fagron	Oxytetracycline hydrochloride	12G10-N04	10
Euro OTC	Oxytetracycline hydrochloride	1306022	1
Euro OTC	Oxytetracycline hydrochloride	1306022-02	11
Euro OTC	Oxytetracycline hydrochloride	1306022-03	3
Fagron	Oxytetracycline hydrochloride	13I26-N11	1
Fagron	Oxytetracycline hydrochloride	13L19-B33	4
Fagron	Oxytetracycline hydrochloride	130602203	1
Caelo	Oxytetracycline hydrochloride	13L19-B33	1
Fagron	Oxytetracycline hydrochloride	13L19-B33-290730	2
Caelo	Oxytetracycline hydrochloride	13L19-B33-290730	1
Fagron	Oxytetracycline hydrochloride	13L19-B33-290731	3
Fagron	Oxytetracycline hydrochloride	13L19-B33-290731	1
Fagron	Oxytetracycline hydrochloride	14/22-B01-301465	2
Fagron	Oxytetracycline hydrochloride	13L19-B33-290732	1
Euro OTC	Oxytetracycline hydrochloride	14070120-02	1
Euro OTC	Oxytetracycline hydrochloride	1407012-01	7
Euro OTC	Oxytetracycline hydrochloride	1407011202	1
Euro OTC	Oxytetracycline hydrochloride	1407012-02	8
Phönix Gotha	Oxytetracycline hydrochloride	1407012-02	1
Euro OTC	Oxytetracycline hydrochloride	1407012-03	2
Euro OTC	Oxytetracycline hydrochloride	14128003	2
Caelo	Oxytetracycline hydrochloride	14128003	1
Caelo	Oxytetracycline hydrochloride	14128004	1
Fagron	Oxytetracycline hydrochloride	14I22-B01	1
Fagron	Oxytetracycline hydrochloride	14I22-B01-301464	1
Fagron	Oxytetracycline hydrochloride	14I22-B01-301465	1
Euro OTC	Oxytetracycline hydrochloride	1506037-01	7
Euro OTC	Oxytetracycline hydrochloride	1506037	1
Euro OTC	Oxytetracycline hydrochloride	15051507	1
Caelo	Oxytetracycline hydrochloride	15060108	1
Fagro/Anzag	Oxytetracycline hydrochloride	14I22-B01-301464	1
Caesar&Loretz GmbH	Oxytetracycline hydrochloride	15060109	1
Caelo	Oxytetracycline hydrochloride	1506037-01	3
Caelo	Oxytetracycline hydrochloride	15060109	2
Norbrook Lab.Ltd.	Oxytetracycline hydrochloride	1506037-01	2
Caelo	Oxytetracycline hydrochloride	150603702	1
Euro OTC	Oxytetracycline hydrochloride	1506037-02	10
Caelo	Oxytetracycline hydrochloride	1506037-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Laborchemie Apolda/Phönix	Oxytetracycline hydrochloride	1506037-02	1
Euro OTC	Oxytetracycline hydrochloride	15060377-01	1
Euro OTC	Oxytetracycline hydrochloride	1506037-03	5
Euro OTC	Oxytetracycline hydrochloride	150603703	1
Euro OTC	Oxytetracycline hydrochloride	1602025-01	6
Euro OTC	Oxytetracycline hydrochloride	28011505	1
Caelo	Oxytetracycline hydrochloride	16077001	2
Fagron	Oxytetracycline hydrochloride	3-45703A	1
Caelo	Oxytetracycline hydrochloride	16077002	1
Fagron	Oxytetracycline hydrochloride	4-49732A-2	1
Euro OTC	Oxytetracycline hydrochloride	1011045-01	3
Euro OTC	Oxytetracycline hydrochloride	513E-02865	1
Spangropharm	Oxytetracycline hydrochloride	1111061-01	1
Euro OTC	Oxytetracycline hydrochloride	1111061-01	9
EuRho	Oxytetracycline hydrochloride	1111061-01	1
Euro OTC	Oxytetracycline hydrochloride	1111061-61	1
Gehe	Oxytetracycline hydrochloride	11336507	1
Caelo	Oxytetracycline hydrochloride	11336507	1
Gehe	Oxytetracycline hydrochloride	11336509	1
Caelo	Oxytetracycline hydrochloride	11336510	6
Caelo	Oxytetracycline hydrochloride	11336509	1
Euro OTC	Oxytetracycline hydrochloride	1205028-01	7
Euro OTC	Oxytetracycline hydrochloride	12050-28	1
phönix, 24.01.2013	Oxytetracycline hydrochloride	1205028-01	1
Phönix	Oxytetracycline hydrochloride	1205028-01	1
EuRho	Oxytetracycline hydrochloride	1205028-01	2
Euro OTC	Oxytetracycline hydrochloride	120502801	1
Alliance Healthcare	Oxytetracycline hydrochloride	1205028-02	1
Euro OTC	Oxytetracycline hydrochloride	120502802	1
Alliance Healthcare	Oxytetracycline hydrochloride	1205222-01	1
Caelo	Oxytetracycline hydrochloride	12130001	3
Caesar & Loretz GmbH Hi...	Oxytetracycline hydrochloride	12328104	1
Phönix Gotha	Oxytetracycline hydrochloride	1232814	1
Fagron	Oxytetracycline hydrochloride	12A26-N05	6
Gehe	Oxytetracycline hydrochloride	12A26-N05	2
Caelo	Oxytetracycline hydrochloride	12G10-N04	2
Gehe	Oxytetracycline hydrochloride	12g10-n04	1
Caelo	Oxytetracycline hydrochloride	1306022-01	1
Fagron	Oxytetracycline hydrochloride	13D08-N11	6
Caelo	Oxytetracycline hydrochloride	13D08-N11	1
Fagron	Oxytetracycline hydrochloride	13L19-B33-29073	1
Caelo	Oxytetracycline hydrochloride	21021305	1
Caelo	Oxytetracycline hydrochloride	2-28230A	1
	Oxytetracycline hydrochloride		1
Fagron	Oxytetracycline hydrochloride	C22H25CIN209	1
Euro OTC	Oxytetracycline hydrochloride	700116	1
Gehe	Oxytetracycline hydrochloride	1205028-01	1
Gehe	Oxytetracycline hydrochloride	1306022-02	1

- 55 765 spectra from 335 *Apo-Ident* customers from a total of 20 545 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Oxytetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Oxytetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	500	0	75 378
Type B	0	140	0	81 208
Type C	0	197	39	55 765

The substance/substance group *Oxytetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8622 %)	83.4746 % (> 82.2034 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20847	21999	6.64	34.01
20848	21836	13.38	34.35
21039	21600	6.54	38.49
21600	21600	0.00	39.87
21836	21836	0.00	34.77
21915	21836	16.28	32.68
21999	21999	0.00	32.76
22503	22503	0.00	33.76
22546	22546	0.00	31.69
22658	22658	0.00	32.26
22669	22669	0.00	34.31
22839	21836	13.36	34.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pancreas powder**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20976-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pancreas powder; Pancreatinum; Pancreatis pulvis

Special notes

When selecting the *Pancreas powder* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pancreas powder*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pancreas powder	13118902	20976	40	1402190
Caelo	Pancreas powder	13395203	21481	40	20131218
Caelo	Pancreas powder	161397	22482	40	20160527*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Pancreas powder*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Pancreas powder*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pancreas powder	10327501	20234	40
Caelo	Pancreas powder	13395203	21481 [†]	20
Caelo	Pancreas powder	161397	22482 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Pancreas powder*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pancreas powder* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pancreas powder* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	80	0	81 268
Type C	0	0	0	56 001

The substance/substance group *Pancreas powder* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20976	20976	0.00	36.14
21481	20976	14.31	34.49
22482	22482	0.00	32.88

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Papaverine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20481-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Papaverine hydrochloride; Papaverini hydrochloridum; Papaverinum hydrochloricum

Special notes

When selecting the *Papaverine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Papaverine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Papaverine hydro...	11L05-N10	20481	40	AR-13-FG-001229-01
Caelo	Papaverine hydro...	13324310	21735	40	20130920
Caelo	Papaverine hydro...	123161	23054	40	20121127*

Validation samples

A total of 213 227 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 *Papaverine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Papaverine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Papaverine hydrochloride	9157221	20227	40
Caelo	Papaverine hydrochloride	13324310	21735 [†]	20
Caelo	Papaverine hydrochloride	163159	23053	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Papaverine hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Papaverine hydrochloride	12316105	1
Phönix Gotha	Papaverine hydrochloride	13324306	1
Phönix Gotha	Papaverine hydrochloride	12166101	1
Phönix Gotha	Papaverine hydrochloride	9157221	1
GATT-KOLLER/PHOENIX	Papaverine hydrochloride	2927/07131314	1
Caelo	Papaverine hydrochloride	13324307	1
Caelo	Papaverine hydrochloride	12166112	1
Caelo	Papaverine hydrochloride		1
Caelo	Papaverine hydrochloride	91964419	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Papaverine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Papaverine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	0	81 248
Type C	0	9	0	55 992

The substance/substance group *Papaverine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20481	20481	0.00	38.47
21735	23054	11.35	43.60
23054	23054	0.00	37.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Paracetamol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20972-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Paracetamol; Paracetamolum

Special notes

When selecting the *Paracetamol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Paracetamol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Paracetamol	13D30-N03	20972	40	1402271
Fagron	Paracetamol	13D16-N08	20973	40	1402296
Fagron	Paracetamol	13G23-N03	20974	40	1402297
Euro OTC	Paracetamol	1111024-02	21598	40	20120123
Caelo	Paracetamol	15075706	22608	40	20150424

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Paracetamol*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Paracetamol*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Paracetamol	pending	20160	40
Euro OTC	Paracetamol	1111024-02	21598 [†]	20
Caelo	Paracetamol	15075707	22822	40

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 35 spectra from 15 *Apo-Ident* customers from 24 batches from the substance/substance group *Paracetamol*.

Supplier	Substance	Batch	Spectra
Caelo	Paracetamol	10325020	1
Caelo	Paracetamol	11300120	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
Caelo	Paracetamol	12G23-N04	1
Caelo	Paracetamol	13082005	1
Caelo	Paracetamol	13082008	1
Caelo	Paracetamol	13082010	3
Caelo	Paracetamol	13B05-N04	1
Caelo	Paracetamol	13082011	1
Caelo	Paracetamol	15075704	5
Caelo	Paracetamol	15075708	1
Jenne	Paracetamol	15245901	1
Caelo	Paracetamol	15245901	1
Caelo	Paracetamol	15245902	1
Caelo	Paracetamol	1814U-02045	1
Caelo	Paracetamol	1912M-02045	1
Caelo	Paracetamol	2815I-02045	1
Caelo	Paracetamol	10325017	1
Caelo	Paracetamol	11300113	2
Caelo	Paracetamol	10065102	1
Caelo	Paracetamol	11300108	1
Euro OTC	Paracetamol	1111024-02	1
Caelo	Paracetamol	10325018	1
Euro OTC	Paracetamol	1111024-01	1
Caelo	Paracetamol	Paracetamol2	1
Caelo	Paracetamol	Paracetamol1	1

- 55 966 spectra from 335 *Apo-Ident* customers from a total of 20 587 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Paracetamol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Paracetamol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	81	19	81 248
Type C	0	26	9	55 966

The substance/substance group *Paracetamol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	81.0000 % (> 78.0000 %)
Type C	100.0000 % (> 99.8622 %)	74.2857 % (> 65.7143 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20972	20972	0.00	62.76
20973	20973	0.00	65.14
20974	20974	0.00	60.27
21598	20972	1.99	66.23
22608	20972	18.02	64.30

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Patent blue V, E131**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20469-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Patent blue V, E131

Special notes

When selecting the *Patent blue V, E131* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Patent blue V, E131*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Patent blue V, E...	11138401	20469	40	AR-13-FG-002961-01
Caelo	Patent blue V, E...	12364206	21384	40	1508043
Caelo	Patent blue V, E...	12364206	21385	40	20130110
Caelo	Patent blue V, E...	13351803	21695	40	20131114
Caelo	Patent blue V, E...	13351807	22387	40	1702362

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Patent blue V, E131*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Patent blue V, E131*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Patent blue V, E131	10379902	20209	40
Caelo	Patent blue V, E131	13351803	21695 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 14 *Apo-Ident* customers from 10 batches from the substance/substance group *Patent blue V, E131*.

Supplier	Substance	Batch	Spectra
Caelo	Patent blue V, E131	11305303	3
Caelo	Patent blue V, E131	12364206	4
Caelo	Patent blue V, E131	13351807	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
Caelo	Patent blue V, E131	13351808	1
Noweda	Patent blue V, E131	10273001	1
Noweda	Patent blue V, E131	11138402	1
Caelo	Patent blue V, E131	11305302	1
Caelo	Patent blue V, E131	12364202	1
Caelo	Patent blue V, E131	12364204	1
Caelo	Patent blue V, E131		1

- 55 985 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Patent blue V, E131* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Patent blue V, E131* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	20	40	81 288
Type C	0	13	3	55 985

The substance/substance group *Patent blue V, E131* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	33.3333 % (> 28.3333 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20469	20469	0.00	90.37
21384	21384	0.00	86.89
21385	21384	1.16	87.32
21695	20469	18.52	89.72
22387	22387	0.00	88.83

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Phenazone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22532-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Phenazone; Phenazonum; Phenylidimethylpyrazolonum

Special notes

When selecting the *Phenazone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Phenazone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenazone	13G16-B07-287172	22532	40	AR-16-FG-011360-01
Fagron	Phenazone	13G16-B07-287172	22720	40	20130814
Caelo	Phenazone	15415107	22827	40	20151215

Validation samples

A total of 213 227 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 *Phenazone*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Phenazone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Phenazone	15415101	22576	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Phenazone*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Phenazone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenazone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Phenazone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22532	22532	0.00	42.28
22720	22532	6.48	39.95
22827	22532	8.93	35.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pheniramine maleate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20694-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pheniramine maleate; Pheniramini maleas; Pheniraminum maleinicum

Special notes

When selecting the *Pheniramine maleate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pheniramine maleate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pheniramine male...	12200502	20694	40	1401559
Euro OTC	Pheniramine male...	1109013-02	20756	40	20111122
Fagron	Pheniramine male...	13D24-N04	20928	40	20130530

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Pheniramine maleate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Pheniramine maleate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pheniramine maleate	15172702	22790	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 *Apo-Ident* customers from 10 batches from the substance/substance group *Pheniramine maleate*.

Supplier	Substance	Batch	Spectra
Caelo	Pheniramine maleate	12352608	1
Caelo	Pheniramine maleate	12352602	1
Supriya LifeScience Ltd...	Pheniramine maleate	14C25-B01	1
Euro OTC	Pheniramine maleate	1209032-01	1
Fagron	Pheniramine maleate	14C25-B01-295293	1
Supriya LifeScience Ltd...	Pheniramine maleate	SLL/P/1213063	1
Alliance Healthcare	Pheniramine maleate	12L04-N05	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Pheniramine maleate	9276210	1
Fagron	Pheniramine maleate	32/06-N02	1
Fagron	Pheniramine maleate	12L04-N05	1
Fagron	Pheniramine maleate	12I06-N02	1

- 55 990 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pheniramine maleate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pheniramine maleate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	11	0	55 990

The substance/substance group *Pheniramine maleate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20694	20694	0.00	41.60
20756	20694	14.84	42.31
20928	20694	6.69	40.06

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Phenylbutazon**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20447-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Phenylbutazon; Phenylbutazonum

Special notes

When selecting the *Phenylbutazon* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Phenylbutazon*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Phenylbutazon	102629010	20447	40	AR-12-FG-009256-01
Caelo	Phenylbutazon	14057202	21379	40	20140321
Euro OTC	Phenylbutazon	1305050-02	21605	40	AR-15-FG-005687-01
Euro OTC	Phenylbutazon	1507023	21855	40	0000010637

Validation samples

A total of 213 227 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 *Phenylbutazon*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 4 reference samples from the substance/substance group *Phenylbutazon*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Phenylbutazon	1305050-02	21605 [†]	20
Euro OTC	Phenylbutazon	1507023	21855 [†]	20
Caelo	Phenylbutazon	161121	22471	60
Euro OTC	Phenylbutazon	1604033	22563	40

- 81 208 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Phenylbutazon*.

Supplier	Substance	Batch	Spectra
Fagron	Phenylbutazon	11H26-N02	1
Caelo	Phenylbutazon	10262901	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Phenylbutazon* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenylbutazon* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	140	0	81 208
Type C	0	2	0	55 999

The substance/substance group *Phenylbutazon* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20447	20447	0.00	39.46
21379	21855	3.65	41.90
21605	21605	0.00	40.38
21855	21855	0.00	40.37

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Phenylephrine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20567-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Phenylephrine hydrochloride; Phenylephrini hydrochloridum; Phenylephrinum hydrochloricum

Special notes

When selecting the *Phenylephrine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Phenylephrine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenylephrine hy...	11L22-N10	20567	40	1406058
Fagron	Phenylephrine hy...	11L22-N10	20594	40	20120105
Fagron	Phenylephrine hy...	12J19-B40-288254	21051	40	20131210
Fagron	Phenylephrine hy...	14H13-B02-308438	21960	40	AR-16-FG-008920-01
Fagron	Phenylephrine hy...	16A20-B07-317987	22388	40	AR-16-FG-013385-01

Validation samples

A total of 213 227 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 *Phenylephrine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Phenylephrine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Phenylephrine hydrochloride	14H13-B02-308438	21960 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 35 spectra from 9 *Apo-Ident* customers from 23 batches from the substance/substance group *Phenylephrine hydrochloride*.

Supplier	Substance	Batch	Spectra
Fagron	Phenylephrine hydrochloride	10091504	1
Fagron	Phenylephrine hydrochloride	13K25-B02-293844	3
Fagron	Phenylephrine hydrochloride	12J19-B40-288253	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
Jenne	Phenylephrine hydrochloride	14H13-B02	2
Fagron	Phenylephrine hydrochloride	14H13-B02-299816	3
Fagron	Phenylephrine hydrochloride	14H13-B02-299814	1
Fagron	Phenylephrine hydrochloride	14H13B02-299817	1
Fagron	Phenylephrine hydrochloride	14H13B02299817	1
Fagron	Phenylephrine hydrochloride	14H13-B02-309892	2
Phoenix	Phenylephrine hydrochloride	15F09-B08	1
Fagron	Phenylephrine hydrochloride	12A03-N09	1
Fagron	Phenylephrine hydrochloride	1021402	1
Fagron	Phenylephrine hydrochloride	15F09-B08-316796	1
Fagron	Phenylephrine hydrochloride	12C08-N17	1
Fagron	Phenylephrine hydrochloride	13a03-n09	1
Fagron	Phenylephrine hydrochloride	12F01-N20	3
Fagron	Phenylephrine hydrochloride	12g19-n04	1
Fagron	Phenylephrine hydrochloride	13A03-N09	4
Fagron	Phenylephrine hydrochloride	12G19-N04	1
Fagron	Phenylephrine hydrochloride	13B14-N03	1
Fagron	Phenylephrine hydrochloride	13D09-N02	1
Fagron	Phenylephrine hydrochloride	13G10-N04	1
Fagron	Phenylephrine hydrochloride	CH12F01-N20	1

- 55 966 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Phenylephrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenylephrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	20	0	81 328
Type C	0	34	1	55 966

The substance/substance group *Phenylephrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.1429 % (> 88.5714 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20567	20567	0.00	35.80
20594	20567	7.25	37.04
21051	21960	2.14	39.42
21960	21960	0.00	40.88
22388	22388	0.00	41.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Phenytoin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20949-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Phenytoin; Diphenylhydrantoinum; Phenytoinum

Special notes

When selecting the *Phenytoin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Phenytoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Phenytoin	13G26-N02	20949	40	1401380
Fagron	Phenytoin	15E12-B05-312661	22271	30	20150519

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 70 spectra of 2 reference samples from the substance/substance group *Phenytoin*. These samples are listed above in the [calibration samples](#) section.
- 75 808 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 55 spectra of 2 reference samples from the substance/substance group *Phenytoin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Phenytoin	12I07-N02	20678	40
Fagron	Phenytoin	15E12-B05-312661	22271 [†]	15

- 81 293 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Phenytoin*.

Supplier	Substance	Batch	Spectra
Fagron	Phenytoin	12I07-N02	1
Fagron	Phenytoin	12C27N13	1
Fagron	Phenytoin	13G26-N02	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*.

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Phenytoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Phenytoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	70	0	75 808
Type B	0	55	0	81 293
Type C	0	3	0	55 998

The substance/substance group *Phenytoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 91.4286 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 89.0909 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20949	20949	0.00	86.99
22271	20949	5.60	88.72

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pilocarpine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21519-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pilocarpine hydrochloride; Pilocarpini hydrochloridum; Pilocarpinum hydrochloricum

Special notes

When selecting the *Pilocarpine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pilocarpine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Pilocarpine hydr...	12217319	21518	40	20120806
Caelo	Pilocarpine hydr...	12217319	21519	40	1501660
Euro OTC	Pilocarpine hydr...	1305044-01	21629	40	20130725
Euro OTC	Pilocarpine hydr...	1603047	22553	40	20160429*
Caelo	Pilocarpine hydr...	12217319	21518SI	40	20120806
Euro OTC	Pilocarpine hydr...	1305044-01	21629SI	40	20130725
Euro OTC	Pilocarpine hydr...	1603047	22553SI	40	20160429*

Validation samples

A total of 213 227 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 *Pilocarpine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 140 spectra of 6 reference samples from the substance/substance group *Pilocarpine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Pilocarpine hydrochloride	9234907	20105	40
Caelo	Pilocarpine hydrochloride	12217319	21518 [†]	20
Caelo	Pilocarpine hydrochloride	12217319	21519 [†]	20
Euro OTC	Pilocarpine hydrochloride	1305044-01	21629 [†]	20
Caelo	Pilocarpine hydrochloride	12217319	21518SI [†]	20
Euro OTC	Pilocarpine hydrochloride	1305044-01	21629SI [†]	20

- 81 208 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 27 spectra from 22 *Apo-Ident* customers from 19 batches from the substance/substance group *Pilocarpine hydrochloride*.

Supplier	Substance	Batch	Spectra
Euro OTC	Pilocarpine hydrochloride	1305044-01	4
Euro OTC	Pilocarpine hydrochloride	130504401	2
Euro OTG	Pilocarpine hydrochloride	1305044-01	1
Caelo	Pilocarpine hydrochloride	1305044-03	1
Caelo	Pilocarpine hydrochloride	12217316	1
Euro OTC	Pilocarpine hydrochloride	1305044-03	2
Gehe	Pilocarpine hydrochloride	15198610	1
Leyhs	Pilocarpine hydrochloride	15198701	1
Fagron	Pilocarpine hydrochloride	13H24-N03	1
Noweda	Pilocarpine hydrochloride	10CD04	1
Noweda	Pilocarpine hydrochloride	11037801	1
Euro OTC	Pilocarpine hydrochloride	1202031-01	1
Caelo	Pilocarpine hydrochloride	1116190	1
Euro OTC	Pilocarpine hydrochloride	1202031-02	1
Caelo	Pilocarpine hydrochloride	12217302	1
Caelo	Pilocarpine hydrochloride	12K07-N09	1
Caelo	Pilocarpine hydrochloride	12217307	1
Sanacorp	Pilocarpine hydrochloride	12217302	1
Caelo	Pilocarpine hydrochloride	2211112032607	1
Caelo	Pilocarpine hydrochloride	25051303	1
Euro OTC	Pilocarpine hydrochloride	2909041V-02	1
Euro OTC	Pilocarpine hydrochloride	Euroo	1

- 55 974 spectra from 335 *Apo-Ident* customers from a total of 20 592 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pilocarpine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pilocarpine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	140	0	81 208
Type C	0	27	0	55 974

The substance/substance group *Pilocarpine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.7143 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 77.7778 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21518	21519	11.98	43.22
21519	21519	0.00	37.38
21629	21519	5.59	39.31
22553	22553	0.00	34.23

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Poloxamer 407**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20540-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Poloxamer 407

Special notes

When selecting the *Poloxamer 407* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Poloxamer 407*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Poloxamer 407	12044205	20540	40	20120224
Caelo	Poloxamer 407	14196101	21652	40	AR-14-FG-013090-01
Fagron	Poloxamer 407	14G17-B03-296866	21726	40	20140806

Validation samples

A total of 213 227 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 *Poloxamer 407*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Poloxamer 407*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Poloxamer 407	12044205	20568	40
Caelo	Poloxamer 407	12044202	20607	40
Caelo	Poloxamer 407	14196101	21652 [†]	20
Fagron	Poloxamer 407	14G17-B03-296866	21726 [†]	20

- 81 228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 27 spectra from 18 *Apo-Ident* customers from 20 batches from the substance/substance group *Poloxamer 407*.

Supplier	Substance	Batch	Spectra
Fagron	Poloxamer 407	914I-07027	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
Fagron	Poloxamer 407	315E-07027	1
Caelo	Poloxamer 407	12286806	1
Caelo	Poloxamer 407	13133203	2
Fagron	Poloxamer 407	13G29-N01	1
Caelo	Poloxamer 407	14196101	2
Caelo	Poloxamer 407	13133207	1
Caelo	Poloxamer 407	14196105	1
Caelo	Poloxamer 407	14196108	3
Caelo	Poloxamer 407	14359501	1
Caelo	Poloxamer 407	15397802	2
Fagron	Poloxamer 407	WPWI610C	1
Caesar & Loretz GmbH	Poloxamer 407	15183102	1
Phonix	Poloxamer 407	12/13-N10	1
Fagron	Poloxamer 407	5315I-07027	1
Caelo	Poloxamer 407	12286801	2
Fagron	Poloxamer 407	12K23-N03	1
Caelo	Poloxamer 407	12286805	1
Caelo	Poloxamer 407	13133201	1
Noweda	Poloxamer 407	13133201	1
Fagron	Poloxamer 407	5211Q-07027	1

- 55 974 spectra from 335 *Apo-Ident* customers from a total of 20 591 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Poloxamer 407* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Poloxamer 407* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	120	0	81 228
Type C	0	25	2	55 974

The substance/substance group *Poloxamer 407* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	92.5926 % (> 81.4815 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20540	21652	8.93	27.17
21652	21652	0.00	28.66
21726	21652	4.20	28.92

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Polymyxin B sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20853-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Polymyxin B sulfate; Polymixinum-B-sulfuricum; Polymyxin B sulphate; Polymyxini B sulfas

Special notes

When selecting the *Polymyxin B sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Polymyxin B sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Polymyxin B sulf...	13C12-N02	20853	40	1402691
Euro OTC	Polymyxin B sulf...	1304033-01	21094	39	20130829
Fagron	Polymyxin B sulf...	12G13-N05	21258	40	1410347
Euro OTC	Polymyxin B sulf...	1202039-02	21329	40	1411033
Euro OTC	Polymyxin B sulf...	1304033-02	21584	40	20130612
Fagron	Polymyxin B sulf...	13I13-N05	21595	40	AR-15-FG-001516-01

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Polymyxin B sulf. ...	14F04-B03-296722	21957	40	20140708
Euro OTC	Polymyxin B sulf. ...	1505005-01	21980	40	AR-16-FG-005387-01
Fagron	Polymyxin B sulf. ...	15H14-B01-314364	22323	40	20150902
Caelo	Polymyxin B sulf. ...	153501	22451	40	20160318*
Euro OTC	Polymyxin B sulf. ...	1604016	22542	40	20160509*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 439 spectra of 11 reference samples from the substance/substance group *Polymyxin B sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 439 spectra from a total of 1565 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 276 spectra of 11 reference samples from the substance/substance group *Polymyxin B sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Polymyxin B sulfate	pending	20156	35
Euro OTC	Polymyxin B sulfate	1202039-02	20904	40
Fagron	Polymyxin B sulfate	13E06-N12	20912	40
Euro OTC	Polymyxin B sulfate	1304033-01	21094 [†]	1
Euro OTC	Polymyxin B sulfate	1304033-02	21584 [†]	20
Fagron	Polymyxin B sulfate	13I13-N05	21595 [†]	20
Fagron	Polymyxin B sulfate	14F04-B03-296722	21957 [†]	20
Euro OTC	Polymyxin B sulfate	1505005-01	21980 [†]	20
Fagron	Polymyxin B sulfate	15H14-B01-314364	22323 [†]	20
Caelo	Polymyxin B sulfate	153501	22451 [†]	20
Euro OTC	Polymyxin B sulfate	1701010	23012	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 072 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 43 spectra from 31 *Apo-Ident* customers from 27 batches from the substance/substance group *Polymyxin B sulfate*.

Supplier	Substance	Batch	Spectra
Fagron	Polymyxin B sulfate	912A-03315	1
Caelo	Polymyxin B sulfate	1102013-01	1
Euro OTC	Polymyxin B sulfate	11091419	1
Rondell Apotheke	Polymyxin B sulfate	121161	1
Fagron	Polymyxin B sulfate	12G13-N05	1
Euro OTC	Polymyxin B sulfate	1304033-01	2
Großhandel	Polymyxin B sulfate	1304033-02	1
Fagron	Polymyxin B sulfate	13/13-N05	1
Caelo	Polymyxin B sulfate	130403302	1
Euro OTC	Polymyxin B sulfate	130416	2
Fagron	Polymyxin B sulfate	13G05-N06	2
Caelo	Polymyxin B sulfate	1304033-03	1
Caelo	Polymyxin B sulfate	13H28-B02-287953	1
Euroo/Phoenix	Polymyxin B sulfate	1304033-02	1
Euro OTC	Polymyxin B sulfate	1406012-01	2
Euro OTC	Polymyxin B sulfate	140601202	2
Euro OTC	Polymyxin B sulfate	1406012-02	1
Fagron	Polymyxin B sulfate	14F04-B03-296721	1
Euro OTC	Polymyxin B sulfate	1505005-01	3
Euro OTC	Polymyxin B sulfate	150500501	1
Euro OTC	Polymyxin B sulfate	23051502	1
Anzag	Polymyxin B sulfate	11K28-N07	1
Euro OTC	Polymyxin B sulfate	1202039-01	1
Phönix	Polymyxin B sulfate	1202039-01	1
EuRho	Polymyxin B sulfate	1202039-01	1
Alliance Healthcare	Polymyxin B sulfate	1202039-02	1
Euro OTC	Polymyxin B sulfate	1202039-02	4
euroct/gehe	Polymyxin B sulfate	1202039-02	1
Fagron	Polymyxin B sulfate	12D05-N01	1
phönix,24.01.2013	Polymyxin B sulfate	12D05-N01	1
Fagron	Polymyxin B sulfate	12G25-N06	1
Euro OTC	Polymyxin B sulfate	25101201	1
Fagron	Polymyxin B sulfate	13H28-B02-87953	1

- 55 958 spectra from 335 *Apo-Ident* customers from a total of 20 585 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Polymyxin B sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Polymyxin B sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	439	0	75 439
Type B	0	233	43	81 072
Type C	0	36	7	55 958

The substance/substance group *Polymyxin B sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6333 %)
Type B	100.0000 % (> 99.9853 %)	84.4203 % (> 83.3333 %)
Type C	100.0000 % (> 99.8622 %)	83.7209 % (> 76.7442 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20853	20853	0.00	19.50
21094	21980	2.53	27.07
21258	21258	0.00	22.63
21329	21329	0.00	24.51
21584	21980	3.83	25.85
21595	21595	0.00	22.54
21957	21329	11.82	28.01
21980	21980	0.00	24.97
22323	21980	7.05	27.68
22451	22451	0.00	34.53
22542	22542	0.00	22.51

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Potassium citrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20021-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Potassium citrate; Kalii citras; Kalii citricum

Special notes

When selecting the *Potassium citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium citrate	83305269	20021	60	I 2009 000 299
Caelo	Potassium citrate	11102206	20502	40	AR-13-FG-005751-01
Caelo	Potassium citrate	11320212	20655	40	20111201
Caelo	Potassium citrate	13317618	21452	40	20130926
Caelo	Potassium citrate	15123103	21775	40	20150414
Euro OTC	Potassium citrate	1509044	21936	40	20151013*
Caelo	Potassium citrate	161130	22476	40	20160602*
Euro OTC	Potassium citrate	1611017	22921	40	20161207*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 340 spectra of 8 reference samples from the substance/substance group *Potassium citrate*. These samples are listed above in the [calibration samples](#) section.
- 75 538 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 201 spectra of 8 reference samples from the substance/substance group *Potassium citrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium citrate	83305269	20021 [†]	1
Euro OTC	Potassium citrate	1204016-01	20575	40
Caelo	Potassium citrate	13317618	21452 [†]	20
Caelo	Potassium citrate	15123103	21775 [†]	20
Euro OTC	Potassium citrate	1509044	21936 [†]	20
Caelo	Potassium citrate	161130	22476 [†]	20
Euro OTC	Potassium citrate	1603040	22521	40
Euro OTC	Potassium citrate	1606041	22676	40

- 81 147 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

provided by the customer regarding manufacturer and batch number.

- 240 spectra from 94 *Apo-Ident* customers from 101 batches from the substance/substance group *Potassium citrate*.

Supplier	Substance	Batch	Spectra
Caelo	Potassium citrate	14138105	4
Caelo	Potassium citrate	12299207	5
Caelo	Potassium citrate	1215309	1
Caelo	Potassium citrate		14
Gutenberg-Apotheke	Potassium citrate	13135907	1
Caelo	Potassium citrate	13135907	4
Caelo	Potassium citrate	11320202	2
Caelo	Potassium citrate	1234	5
Caelo	Potassium citrate	13080602	8
Caelo	Potassium citrate	5021509	1
Caelo	Potassium citrate	12334	1
Euro OTC	Potassium citrate	123456	6
Labor	Potassium citrate	1234	2
Caelo	Potassium citrate	123test	1
Caelo	Potassium citrate	123Test	2
Caelo	Potassium citrate	123654879	1
Caelo	Potassium citrate	12345678	2
Caelo	Potassium citrate	123Testmessung	1
Caelo	Potassium citrate	12456	1
Caelo	Potassium citrate	12648	1
Euro OTC	Potassium citrate	1311036-01	10
Caelo	Potassium citrate	13080603	2
Caelo	Potassium citrate	1311036-01	1
EuRho/Phönix	Potassium citrate	1311036-01	1
Caelo	Potassium citrate	13135902	1
Phoenix	Potassium citrate	1326PLV-1739	1
Caelo	Potassium citrate	13317602	5
Caelo	Potassium citrate	13135908	2
Caelo	Potassium citrate	13317603	4
Caelo	Potassium citrate	13317613	3
Caelo	Potassium citrate	13317604	2
Phoenix Goettin	Potassium citrate	13317613	1
Caelo	Potassium citrate	13317617	2
Caelo	Potassium citrate	13317618	4
Caelo	Potassium citrate	13317619	3
Phoenix 08.07.2014	Potassium citrate	13317624	1
Euro OTC	Potassium citrate	1406025-01	2
Euro OTC	Potassium citrate	1410014-01	2
Caelo	Potassium citrate	14138107	2
Caelo	Potassium citrate	14138112	2
Caelo	Potassium citrate	14138118	2
Caelo	Potassium citrate	14138119	1
Caelo	Potassium citrate	1413812	1
Euro OTC	Potassium citrate	1504024-01	2
Berkel AHK	Potassium citrate	1438105	1
Caelo	Potassium citrate	15123103	2
Caelo	Potassium citrate	15123102	1
Phönix	Potassium citrate	15123103	1
Caelo	Potassium citrate	15148701	4
Caelo	Potassium citrate	15148702	1
Caelo	Potassium citrate	15148706	3
Caelo	Potassium citrate	15435701	1
Phoenix	Potassium citrate	15148708	1
Caelo	Potassium citrate	15148707	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Potassium citrate	154357025	1
Caelo	Potassium citrate	15435710	1
Caelo	Potassium citrate	1543702	1
Euro OTC	Potassium citrate	1606041-01	1
Caelo	Potassium citrate	2114M1737	1
Caelo	Potassium citrate	3012Q-01737	1
Caelo	Potassium citrate	17061402	1
Caelo	Potassium citrate	83305269	1
Euro OTC	Potassium citrate		1
Caelo	Potassium citrate	9259107	1
Caelo	Potassium citrate	70913Kaci	1
Caelo	Potassium citrate	9259120	1
Caelo	Potassium citrate	10067413	1
Caelo	Potassium citrate	1112008-01	1
Caelo	Potassium citrate	11102201	1
Klenk	Potassium citrate	11102219	1
lohmann	Potassium citrate	1051470	1
Caelo	Potassium citrate	11320201	1
Caelo	Potassium citrate	11320203	2
Caelo	Potassium citrate	11320212	4
Euro OTC	Potassium citrate	1204016-01	6
Caelo	Potassium citrate	11320213	2
Sanacorp/ euRho	Potassium citrate	1204016-01	1
Euro OTC	Potassium citrate	1209005-01	3
Caelo	Potassium citrate	1204016-01	1
Euro OTC	Potassium citrate	1211006-01	3
Phönix	Potassium citrate	1211006-01	1
Caelo	Potassium citrate	1213503	1
Caelo	Potassium citrate	12135302	3
Caelo	Potassium citrate	12135301	2
phönix,10.12.12	Potassium citrate	12135302	1
Caelo	Potassium citrate	12135303	2
Caelo	Potassium citrate	12135309	3
Caelo	Potassium citrate	12135306	2
Phönix	Potassium citrate	12135310	4
Sanacorb	Potassium citrate	12135311	2
Caelo	Potassium citrate	12299201	4
Großhandel	Potassium citrate	12299201	1
Caelo	Potassium citrate	12135311	1
Caelo	Potassium citrate	12299202	2
Caelo	Potassium citrate	12299203	2
Hiperscan	Potassium citrate		1
Fagron	Potassium citrate	1234	1
EuRho	Potassium citrate	1306032-01	3
Phönix 21.05.2013	Potassium citrate	13080602	1
Euro OTC	Potassium citrate	1306032-01	1
Caelo	Potassium citrate	13080604	1
Gehe	Potassium citrate	1311036-01	1
Caelo	Potassium citrate	13135903	3
Caelo	Potassium citrate	13135904	3
Caelo	Potassium citrate	1313598	1
Euro OTC	Potassium citrate	22101303	1
Caelo	Potassium citrate	23121-01737	1
Caelo	Potassium citrate	28021402	1
Caelo	Potassium citrate	3112M01737	1
fragon	Potassium citrate		1
Caelo	Potassium citrate	33131-01737	1
ghfgh	Potassium citrate	3654645	1
Caelo	Potassium citrate	3456	1
Caelo	Potassium citrate	411025-1-P	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Potassium citrate	5555	1
Fagron	Potassium citrate		1
Euro OTC	Potassium citrate	Ch1209005-01	1
Euro OTC	Potassium citrate	Ch1304022-01	2
Caelo	Potassium citrate	71730367	1
HiperScan	Potassium citrate		1
Caelo	Potassium citrate	71730128	1

- 55 761 spectra from 335 *Apo-Ident* customers from a total of 20 517 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	340	0	75 538
Type B	0	201	0	81 147
Type C	0	240	0	55 761

The substance/substance group *Potassium citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.2353 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0149 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 97.5000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20021	20021	0.00	47.85
20502	20502	0.00	49.47
20655	21936	4.03	49.81
21452	20502	5.66	49.40
21775	21936	3.68	49.70
21936	21936	0.00	50.13
22476	22476	0.00	49.91
22921	22921	0.00	49.94

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Potassium hydrogen tartrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20509-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Potassium hydrogen tartrate; Kalii bitartaricum; Kalii hydrogentartras

Special notes

When selecting the *Potassium hydrogen tartrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium hydrogen tartrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium hydrog...	11127421	20509	40	AR-13-FG-006332-01
Caelo	Potassium hydrog...	11345805	20772	40	20120103

Validation samples

A total of 213 227 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 *Potassium hydrogen tartrate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Potassium hydrogen tartrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium hydrogen tartrate	11345805	20588	40
Caelo	Potassium hydrogen tartrate	11345805	20611	40
Caelo	Potassium hydrogen tartrate	11127402	20643	30
Caelo	Potassium hydrogen tartrate	11345805	20644	40
Caelo	Potassium hydrogen tartrate	11345805	20645	40

- 81 158 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 13 batches from the substance/substance group *Potassium hydrogen tartrate*.

Supplier	Substance	Batch	Spectra
Caelo	Potassium hydrogen tartrate	14115208	1
Caelo	Potassium hydrogen tartrate	15081008	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Potassium hydrogen tartrate	13133120	2
Caelo	Potassium hydrogen tartrate	11127417	1
Caelo	Potassium hydrogen tartrate	11345807	1
Caelo	Potassium hydrogen tartrate	11345805	1
Gehe	Potassium hydrogen tartrate	11345808	1
Caelo	Potassium hydrogen tartrate	13030002	1
Caelo	Potassium hydrogen tartrate	13133104	2
Caelo	Potassium hydrogen tartrate	13030006	3
Caelo	Potassium hydrogen tartrate	90573259	1
Caelo	Potassium hydrogen tartrate	13133114	1
Caelo	Potassium hydrogen tartrate	17061303	1

- 55 983 spectra from 335 *Apo-Ident* customers from a total of 20 598 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium hydrogen tartrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium hydrogen tartrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	190	0	81 158
Type C	0	17	1	55 983

The substance/substance group *Potassium hydrogen tartrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.8421 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20509	20509	0.00	63.74
20772	20509	2.65	64.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Potassium orotate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20419-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Potassium orotate; Kalii orotas; Kalii oroticum

Special notes

When selecting the *Potassium orotate* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium orotate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Pharmorgana	Potassium orotate	1000070227	20419	40	AR-12-FG-009684-01
Euro OTC	Potassium orotate	1203038V-02	22335	40	20150723
Euro OTC	Potassium orotate	1203038V-02	22498	40	9757

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Potassium orotate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Potassium orotate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Potassium orotate	1203038V-02	22335 [†]	20
Euro OTC	Potassium orotate	1203038V-02	22808	40

- 81 288 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Potassium orotate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Potassium orotate	1203038-01	1

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium orotate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium orotate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 758
Type B	0	60	0	81 288
Type C	0	1	0	56 000

The substance/substance group *Potassium orotate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20419	20419	0.00	131.26
22335	22498	12.42	125.34
22498	22498	0.00	124.58

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Potassium sodium tartrate tetrahydrate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20782-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Potassium sodium tartrate tetrahydrate; Kalii natrii tartras tetrahydricus; Tartarus natronatus

Special notes

When selecting the *Potassium sodium tartrate tetrahydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium sodium tartrate tetrahydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium sodium...	12030207	20782	40	20120213
Caelo	Potassium sodium...	13216605	20998	40	1404530
Caelo	Potassium sodium...	14376001	21801	40	20150204

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Potassium sodium tartrate tetrahydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 32 spectra of 2 reference samples from the substance/substance group *Potassium sodium tartrate tetrahydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium sodium tartrate te...	14376001	21801 [†]	20
Caelo	Potassium sodium tartrate te...	15375601	not required	12

- 81 316 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Potassium sodium tartrate tetrahydrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium sodium tartrate tetrahydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium sodium tartrate tetrahydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	32	0	81 316
Type C	0	0	0	56 001

The substance/substance group *Potassium sodium tartrate tetrahydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 81.2500 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20782	20998	4.52	50.86
20998	20998	0.00	51.01
21801	20998	7.17	47.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Potassium sorbate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20020-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Potassium sorbate; Kalii sorbas; Kalii sorbinicum

Special notes

When selecting the *Potassium sorbate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium sorbate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium sorbate	90877159	20020	60	I 2009 000 305
Caelo	Potassium sorbate	11214207	20453	40	AR-13-FG-000830-01
Caelo	Potassium sorbate	13224604	21444	40	20130813
Euro OTC	Potassium sorbate	1508025	21892	40	20150902*
Euro OTC	Potassium sorbate	1608013	22786	40	20160819*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 220 spectra of 5 reference samples from the substance/substance group *Potassium sorbate*. These samples are listed above in the [calibration samples](#) section.
- 75 658 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 95 spectra of 4 reference samples from the substance/substance group *Potassium sorbate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium sorbate	90877159	20020 [†]	15
Caelo	Potassium sorbate	13224604	21444 [†]	20
Euro OTC	Potassium sorbate	1508025	21892 [†]	20
Caelo	Potassium sorbate	163266	23059	40

- 81 253 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 316 spectra from 167 *Apo-Ident* customers from 85 batches from the substance/substance group *Potassium sorbate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Potassium sorbate	12211107	18
Caelo	Potassium sorbate	14380601	15
Caelo	Potassium sorbate	15248205	4
Caelo	Potassium sorbate	15248204	12
Caelo	Potassium sorbate	12059909	7
Caelo	Potassium sorbate	13065204	13
Caelo	Potassium sorbate	14380607	4
Caelo	Potassium sorbate	13065217	11
Caelo	Potassium sorbate	13224610	1
Caelo	Potassium sorbate	13224612	12
Caelo	Potassium sorbate	10012210	1
Caelo	Potassium sorbate	10199505	1
Fiebig	Potassium sorbate	10012210	1
Caelo	Potassium sorbate	11261304	4
Caelo	Potassium sorbate	13065205	17
Caelo	Potassium sorbate	12211101	13
AHD	Potassium sorbate	13065216	1
Caelo	Potassium sorbate	2041402	1
Spinnrad	Potassium sorbate	1114331022	1
Caelo	Potassium sorbate	11192305	1
Caelo	Potassium sorbate	13065216	8
Caelo	Potassium sorbate	9305601	2
Fagron	Potassium sorbate	13065211	1
Caesar & Loretz GmbH Hi...	Potassium sorbate	13065217	2
Caelo	Potassium sorbate	1312024-01	2
Euro OTC	Potassium sorbate	1312024-01	2
Caelo	Potassium sorbate	13065222	2
Caelo	Potassium sorbate	13111409	1
Noweda	Potassium sorbate	13065222	1
Caelo	Potassium sorbate	13224604	11
Sonnenberg-Apotheke	Potassium sorbate	13224604	1
Ichthyol/Noweda	Potassium sorbate	13224604	1
Caelo	Potassium sorbate	13224608	2
Apomix/Noweda	Potassium sorbate	13224611	1
Caelo	Potassium sorbate	13224611	4
Anzag 12.01.15	Potassium sorbate	13224611	1
Sanacorp	Potassium sorbate	13224611	1
Euro OTC	Potassium sorbate	13224612	1
Caelo	Potassium sorbate	13277804	1
sana	Potassium sorbate	13224612	1
Caelo	Potassium sorbate	14380602	2
Caelo	Potassium sorbate	14380606	6
Caelo	Potassium sorbate	14380610	9
Caesar&Loretz GmbH/Sana...	Potassium sorbate	14380607	1
Phoenix	Potassium sorbate	14380610	1
Caelo	Potassium sorbate	14380612	1
Caelo	Potassium sorbate	14380620	1
Caelo	Potassium sorbate	14380621	2
Fagron	Potassium sorbate	14380622	1
Caesar & Loretz/Noweda	Potassium sorbate	14380621	1
Caelo	Potassium sorbate	14380622	5
Caesar&Loretz GmbH	Potassium sorbate	14380622	1
Caelo	Potassium sorbate	14380627	2
Caesar & Loretz GmbH	Potassium sorbate	14380627	1
Phoenix	Potassium sorbate	14380627	1
Caelo	Potassium sorbate	14380632	3
Euro OTC	Potassium sorbate	1508025-01	4
Caelo	Potassium sorbate	14380633	1
Caelo	Potassium sorbate	14380635	2
Caelo	Potassium sorbate	15248203	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Potassium sorbate	15382105	3
Caelo	Potassium sorbate	15382114	2
Caesar & Loretz GmbH Hi...	Potassium sorbate	15382105	1
Spinnrad GmbH	Potassium sorbate	214331021	1
Spinnrad	Potassium sorbate	315331021	1
Euro OTC	Potassium sorbate	216331021	1
Fagron	Potassium sorbate	4314U-01748	1
Fagron	Potassium sorbate	3912A-01748	1
Spinnrad/Sanacorp	Potassium sorbate	315331021	1
Spinnrad/Gehe	Potassium sorbate	315331021	1
Fagron	Potassium sorbate	3115M-01748	1
Spinnrad	Potassium sorbate	815331022	1
Phönix Gotha	Potassium sorbate		1
Spinnrad	Potassium sorbate	912331023	3
	Potassium sorbate	10012203	1
spinnrad gmbh	Potassium sorbate	1111331023	1
Euro OTC	Potassium sorbate	1111038-02	1
Spinnrad GmbH	Potassium sorbate	111033102	1
Euro OTC	Potassium sorbate	1111038-01	1
Spinnrad	Potassium sorbate	111033102	1
Euro OTC	Potassium sorbate	111103802	1
Caelo	Potassium sorbate	11214207	1
Caesar & Loretz GmbH	Potassium sorbate	11261303	1
Gehe	Potassium sorbate	11261304	1
Caelo	Potassium sorbate	12059905	4
Phoenix, 11.09.2012	Potassium sorbate	12059909	1
Caelo	Potassium sorbate	12059908	1
Caelo	Potassium sorbate	1205999	1
Caelo	Potassium sorbate	12059914	3
Caelo	Potassium sorbate	1221107	1
Caelo	Potassium sorbate	1221101	1
Noweda	Potassium sorbate	12211101	1
Caelo	Potassium sorbate	12211102	5
Noweda	Potassium sorbate	12211107	1
Kehr	Potassium sorbate	12211107	1
Holderman 24.01.2013	Potassium sorbate	12211107	2
Caelo	Potassium sorbate	12211121	4
Caelo	Potassium sorbate	12211123	1
Caelo	Potassium sorbate	12211108	1
Caelo	Potassium sorbate	12345	1
Gehe 08.05.2013	Potassium sorbate	13065204	1
phonix	Potassium sorbate	13065205	1
Gehe	Potassium sorbate	13065205	1
canea, gehe	Potassium sorbate	13065215	1
Caelo	Potassium sorbate	13065211	1
Gehe	Potassium sorbate	13065216	2
Sanacorp	Potassium sorbate	13065217	1
Caelo	Potassium sorbate	2912M-01748	2
Caelo	Potassium sorbate	200613K1	1
Phoenix	Potassium sorbate	1397235	1
RFI Food Ingredients	Potassium sorbate	2006383927	1
Caelo	Potassium sorbate	20021112-2	1
Spinnrad	Potassium sorbate	312331021	3
Spinnrad	Potassium sorbate	1901211748	1
Caelo	Potassium sorbate	3512M-01748	1
Spinnrad GmbH	Potassium sorbate	912331023	2
siehe WE-Prüfprotokoll	Potassium sorbate	61/11	1
Caelo	Potassium sorbate	912331023	1
Caelo	Potassium sorbate	91623299	2
Caelo	Potassium sorbate	AKD10	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
s.Prüfprotokoll	Potassium sorbate		1
Caelo	Potassium sorbate	K-010213-1	1

- 55 685 spectra from 335 *Apo-Ident* customers from a total of 20 531 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium sorbate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium sorbate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	220	0	75 658
Type B	0	95	0	81 253
Type C	0	306	10	55 685

The substance/substance group *Potassium sorbate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.2727 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 93.6842 %)
Type C	100.0000 % (> 99.8622 %)	96.8354 % (> 95.8861 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20020	20020	0.00	35.66
20453	20453	0.00	35.37

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21444	20020	7.76	37.24
21892	21892	0.00	35.71
22786	22786	0.00	36.12

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Potassium tartrate hemihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20999-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Potassium tartrate hemihydrate; Kalii tartaricum; Kalii tartras hemihydricus

Special notes

When selecting the *Potassium tartrate hemihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Potassium tartrate hemihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potassium tartra...	13331101	20999	40	1403536
Caelo	Potassium tartra...	13331104	21440	40	20131002
Caelo	Potassium tartra...	15167701	21812	40	20150608
Caelo	Potassium tartra...	160289	22462	40	20160405*

Validation samples

A total of 213 227 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 *Potassium tartrate hemihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Potassium tartrate hemihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Potassium tartrate hemihydrate	11225007	20623	40
Caelo	Potassium tartrate hemihydrate	13331104	21440 [†]	20
Caelo	Potassium tartrate hemihydrate	15167701	21812 [†]	20
Caelo	Potassium tartrate hemihydrate	160289	22462 [†]	20

- 81 248 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 4 spectra from 2 *Apo-Ident* customers from 4 batches from the substance/substance group *Potassium tartrate hemihydrate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Potassium tartrate hemihydrate	12322105	1
Caelo	Potassium tartrate hemihydrate	27061304	1
Caelo	Potassium tartrate hemihydrate	13331109	1
Caelo	Potassium tartrate hemihydrate	13111415	1

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Potassium tartrate hemihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Potassium tartrate hemihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	100	0	81 248
Type C	0	4	0	55 997

The substance/substance group *Potassium tartrate hemihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20999	20999	0.00	49.43

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21440	20999	3.15	46.22
21812	22462	5.04	45.22
22462	22462	0.00	49.15

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Povidone 25, soluble**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20684-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Povidone 25, soluble; Povidonum 25, solubile

Special notes

When selecting the *Povidone 25, soluble* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Povidone 25, soluble*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Povidone 25, sol...	12032714	20684	40	1402437
Fagron	Povidone 25, sol...	12E22-N05	20770	40	1411537
Caelo	Povidone 25, sol...	14142103	21378	40	AR-15-FG-000596-01
Fagron	Povidone 25, sol...	13J21-N02	22731	40	AR-16-FG-019116-01

Validation samples

A total of 213 227 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 *Povidone 25, soluble*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Povidone 25, soluble*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Povidone 25, soluble	12B07-N04	20559	40
Fagron	Povidone 25, soluble	12B07-N04	20635	40

- 81 268 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 *Apo-Ident* customers from 11 batches from the substance/substance group *Povidone 25, soluble*.

Supplier	Substance	Batch	Spectra
Caelo	Povidone 25, soluble	14142103	1
Caelo	Povidone 25, soluble	14142109	3
Caelo	Povidone 25, soluble	12032714	1
Caelo	Povidone 25, soluble	14207508	3
Caelo	Povidone 25, soluble	14207511	4
Caelo	Povidone 25, soluble	14207515	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Povidone 25, soluble	15383101	2
Caelo	Povidone 25, soluble	15383102	1
Caelo	Povidone 25, soluble	16051101	1
Caelo	Povidone 25, soluble	12376301	1
Caelo	Povidone 25, soluble	13323407	2

- 55 981 spectra from 335 *Apo-Ident* customers from a total of 20 600 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Povidone 25, soluble* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Povidone 25, soluble* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	0	80	81 268
Type C	0	20	0	55 981

The substance/substance group *Povidone 25, soluble* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	0.0000 % (≥ 0.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 70.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20684	20684	0.00	18.28
20770	20770	0.00	19.75
21378	21378	0.00	16.95
22731	22731	0.00	20.68

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Povidone iodine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20472-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Povidone iodine; Polyvinylpyrrolidoni jodum; Povidonum iodinum

Special notes

When selecting the *Povidone iodine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Povidone iodine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Povidone iodine	10090618	20472	40	AR-13-FG-002960-01
Caelo	Povidone iodine	13337205	21466	40	20131021
Euro OTC	Povidone iodine	1501029-01	21777	40	20150211
Euro OTC	Povidone iodine	1509009	21908	40	20150918*

Validation samples

A total of 213 227 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 *Povidone iodine*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 180 spectra of 6 reference samples from the substance/substance group *Povidone iodine*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Povidone iodine	10090613	20202	40
Euro OTC	Povidone iodine	1110013-02	21073	40
Caelo	Povidone iodine	13337205	21466 [†]	20
Euro OTC	Povidone iodine	1501029-01	21777 [†]	20
Euro OTC	Povidone iodine	1509009	21908 [†]	20
Euro OTC	Povidone iodine	1606026	22675	40

- 81 168 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 46 spectra from 19 *Apo-Ident* customers from 26 batches from the substance/substance group *Povidone iodine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Povidone iodine	1509009-02	1
Phönix	Povidone iodine	1110013-02	1
Caelo	Povidone iodine	11168607	1
Stumpf	Povidone iodine	11168612	1
Herbasinica	Povidone iodine	10090619	1
Caelo	Povidone iodine	11168612	1
Caelo	Povidone iodine	12072605	1
Caelo	Povidone iodine	12153106	2
Caelo	Povidone iodine	12153110	2
Caelo	Povidone iodine	12153116	2
Caelo	Povidone iodine	12153119	2
Euro OTC	Povidone iodine	130901001	1
Fagron	Povidone iodine	1110013-02	1
Euro OTC	Povidone iodine	1401029-01	1
Euro OTC	Povidone iodine	1407032-01	4
Caelo	Povidone iodine	14195813	2
Caelo	Povidone iodine	14195810	3
Euroo/Sana	Povidone iodine	1501029-01	3
Euro OTC	Povidone iodine	1509009-01	1
Euro OTC	Povidone iodine	1603023-01	1
Euroo/Phoenix	Povidone iodine	G3115BPZ0	1
Caelo	Povidone iodine	15121402	1
Euro OTC	Povidone iodine	110013-02	1
Euro OTC	Povidone iodine	G4208BPZ0	1
Euro OTC	Povidone iodine	1110013-02	4
Euro OTC	Povidone iodine	111001302	1
BASF, Noweda	Povidone iodine	1110013-02	2
Caelo	Povidone iodine	19061302	1
Noweda	Povidone iodine	G0354BPZ0	1
Euro OTC	Povidone iodine	1005049-02	1

- 55 955 spectra from 335 *Apo-Ident* customers from a total of 20 586 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Povidone iodine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Povidone iodine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	180	0	81 168
Type C	0	42	4	55 955

The substance/substance group *Povidone iodine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.6667 %)
Type C	100.0000 % (> 99.8622 %)	91.3043 % (> 84.7826 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20472	20472	0.00	20.99
21466	21908	6.29	21.53
21777	21908	5.68	19.60
21908	21908	0.00	20.29

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prasterone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20703-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prasterone; Prasteronum

Special notes

When selecting the *Prasterone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prasterone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prasterone	1102036-01	20703	40	1404310
Fagron	Prasterone	13J10-B02-287175	20960	40	1404309
Euro OTC	Prasterone	1506011	21824	40	20150629*
Fagron	Prasterone	15G14-B07-310827	21917	40	20150814
Euro OTC	Prasterone	1602018	22506	30	20160301*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Prasterone*. These samples are listed above in the [calibration samples](#) section.
- 75 688 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 280 spectra of 7 reference samples from the substance/substance group *Prasterone*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prasterone	10L22-N12	20445	40
Fagron	Prasterone	10L22-N12	20527	40
Euro OTC	Prasterone	1506011	21824 [†]	20
Fagron	Prasterone	15G14-B07-310827	21917 [†]	20
Euro OTC	Prasterone	1506011	21824SI	60
Fagron	Prasterone	15G14-B07-310827	21917SI	60
Euro OTC	Prasterone	1602018	22506SI	40

- 81 068 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 53 spectra from 19 *Apo-Ident* customers from 36 batches from the substance/substance group *Prasterone*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Prasterone	14H12-B05-297727	2
Fagron	Prasterone	15G14-B07-310827	1
Audor Pharma	Prasterone	10050051/1P	1
Euro OTC	Prasterone	1102036-01	1
Euro OTC	Prasterone	1409004-01	3
Audor Pharma	Prasterone	AP11040002P	3
Fagron	Prasterone	12C26-N09	1
Euro OTC	Prasterone	2081302	1
Euro OTC	Prasterone	4091511	1
Fagron	Prasterone	12K30-N06	2
Fagron	Prasterone	12G04-N19	2
Fragon	Prasterone	12G04-N19	1
Nachprüfung	Prasterone	120022	1
Euro OTC	Prasterone	1306021-01	4
Euro OTC	Prasterone	1311002-01	3
Fagron	Prasterone	13J10-B02	1
Euro OTC	Prasterone	1401040-01	2
Caelo	Prasterone	1412028-01	1
Fagron	Prasterone	14C18-B02	1
Fagron	Prasterone	14J21-B03-303458	1
Fagron	Prasterone	14C18-B02-293606	1
Fagron	Prasterone	14C18-Bo2-293603	1
Euro OTC	Prasterone	1506011-01	1
Fagron	Prasterone	19061304	1
Haihang	Prasterone	20130507	1
Haihang Industry	Prasterone	20130816	4
Euro OTC	Prasterone	22021306	1
Fagron	Prasterone	L14050137	1
Caelo	Prasterone	T03-04	1
Euro OTC	Prasterone	1203010-01	1
Euro OTC	Prasterone	26031506	1
Fagron	Prasterone	7013260004	1
NWM Shandong Northwest ...	Prasterone	PST151207	1
Euro OTC	Prasterone	30041509	1
Euro OTC	Prasterone	T03-04/1412028-01	1
Fagron	Prasterone	13J10-B02-287177	1
Euro OTC	Prasterone	XPC0263	1

- 55 948 spectra from 335 *Apo-Ident* customers from a total of 20 575 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prasterone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prasterone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	190	0	75 688
Type B	0	277	3	81 068
Type C	0	53	0	55 948

The substance/substance group *Prasterone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8421 %)
Type B	100.0000 % (> 99.9853 %)	98.9286 % (> 97.8571 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 88.6792 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20703	20703	0.00	52.88
20960	20960	0.00	56.98
21824	21824	0.00	54.39
21917	21824	16.25	55.66
22506	22506	0.00	49.57

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednicarbate, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20196-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prednicarbate, micronized; Prednicarbatum micronisatum

Special notes

When selecting the *Prednicarbate, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednicarbate, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednicarbate, m...	10J04-N10	20196	40	AR-12-FG-006257-01
Fagron	Prednicarbate, m...	12D27-N04	20700	40	20120509
Caelo	Prednicarbate, m...	13119402	20832	35	1501576
Caelo	Prednicarbate, m...	13119402	20833	40	20130517
Caelo	Prednicarbate, m...	13372404	21368	40	AR-15-FG-007941-02
Caelo	Prednicarbate, m...	13372404	21369	40	20131119

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednicarbate, m...	14A27-B02-291256	21572	40	AR-16-FG-011442-01
Euro OTC	Prednicarbate, m...	1302033-02	21610	40	1509286
Euro OTC	Prednicarbate, m...	1507011	21858	35	20150730*
Euro OTC	Prednicarbate, m...	1601058	22366	30	20160223*
Fagron	Prednicarbate, m...	12D27-N04	20700SI	33	20120509
Caelo	Prednicarbate, m...	13119402	20833SI	20	20130517
Caelo	Prednicarbate, m...	13372404	21369SI	23	20131119
Euro OTC	Prednicarbate, m...	1601058	22366SI	21	20160223*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 477 spectra of 14 reference samples from the substance/substance group *Prednicarbate, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 401 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 510 spectra of 20 reference samples from the substance/substance group *Prednicarbate, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednicarbate, micronized	14A27-B02-291256	21572 [†]	20
Euro OTC	Prednicarbate, micronized	1302033-02	21610 [†]	20
Euro OTC	Prednicarbate, micronized	1507011	21858 [†]	19
Euro OTC	Prednicarbate, micronized	1601058	22366 [†]	15
Caelo	Prednicarbate, micronized	160874	22447	60
Euro OTC	Prednicarbate, micronized	1605001	22558	30
Euro OTC	Prednicarbate, micronized	1607012	22703	40
Euro OTC	Prednicarbate, micronized	1609022	22860	40
Caelo	Prednicarbate, micronized	170138	23040	40
Fagron	Prednicarbate, micronized	12D27-N04	20700SI [†]	15
Caelo	Prednicarbate, micronized	13119402	20833SI [†]	10

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednicarbate, micronized	13372404	21369SI [†]	10
Fagron	Prednicarbate, micronized	14A27-B02-291256	21572SI	36
Euro OTC	Prednicarbate, micronized	1507011	21858SI	15
Euro OTC	Prednicarbate, micronized	1601058	22366SI [†]	10
Caelo	Prednicarbate, micronized	160874	22447SI	30
Euro OTC	Prednicarbate, micronized	1605001	22558SI	25
Euro OTC	Prednicarbate, micronized	1607012	22703SI	28
Euro OTC	Prednicarbate, micronized	1609022	22860SI	27
Caelo	Prednicarbate, micronized	170138	23040SI	20

- 80 838 spectra from a total of 1935 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 248 spectra from 96 *Apo-Ident* customers from 97 batches from the substance/substance group *Prednicarbate, micronized*.

Supplier	Substance	Batch	Spectra
Fagron	Prednicarbate, micronized	8081403	1
Fagron	Prednicarbate, micronized	10J04-N10	1
Fagron	Prednicarbate, micronized	11D29-N06	1
Fagron	Prednicarbate, micronized	13/23-N04	3
Fagron	Prednicarbate, micronized	11L23-N07	6
Sino Phyto	Prednicarbate, micronized	13224401	1
Caelo	Prednicarbate, micronized	13119402	2
Caelo	Prednicarbate, micronized	13119401	1
Caelo	Prednicarbate, micronized	13224401	6
Caelo	Prednicarbate, micronized	13372403	8
Caelo	Prednicarbate, micronized	13224406	1
Caelo	Prednicarbate, micronized	13372408	1
Apomix/Noweda	Prednicarbate, micronized	13372410	2
Caelo	Prednicarbate, micronized	13372410	4
Caelo	Prednicarbate, micronized	13372411	1
Caelo	Prednicarbate, micronized	13372419	2
Fagron	Prednicarbate, micronized	13g05-n03	1
Fagron	Prednicarbate, micronized	13I23-N04	6
Fagron	Prednicarbate, micronized	14A27-B02	1
Fagron	Prednicarbate, micronized	14A27-B02-291256	15
Fagron	Prednicarbate, micronized	14a27-b02-291256	2
Fagron	Prednicarbate, micronized	14A27-B02-291258	2
Fagron	Prednicarbate, micronized	14A27-B02-295796	5
Caelo	Prednicarbate, micronized	14A27-B02-295796	1
Fagron	Prednicarbate, micronized	14A27-B02-295797	4
Fagron	Prednicarbate, micronized	14B13-B31-291255	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
Fagron	Prednicarbate, micronized	14J16B06	1
Fagron	Prednicarbate, micronized	14J16-B06-303465	10
Fagron	Prednicarbate, micronized	14J16-B06303465	1
Fagron	Prednicarbate, micronized	14J16B06303466	1
Fagron	Prednicarbate, micronized	14J16-Bo6303465	1
Euro OTC	Prednicarbate, micronized	1501033-02	2
Caelo	Prednicarbate, micronized	1507011-01	1
Euro OTC	Prednicarbate, micronized	1507011-01	1
Euro OTC	Prednicarbate, micronized	1507011-02	2
Caelo	Prednicarbate, micronized	15181403	10
Hedinger/ Sanacorp	Prednicarbate, micronized	15181403	1
Caelo	Prednicarbate, micronized	15181404	3
Apotärze	Prednicarbate, micronized	15181409	1
Caelo	Prednicarbate, micronized	15181409	2
Caelo	Prednicarbate, micronized	15181411	1
caesar&lorenz,Phönix	Prednicarbate, micronized	15181411	1
Caelo	Prednicarbate, micronized	15446301	14
Noweda	Prednicarbate, micronized	15446301	1
Caelo	Prednicarbate, micronized	15446302	5
Caelo	Prednicarbate, micronized	15446303	3
Caelo	Prednicarbate, micronized	15446305	2
E und J, 22.07.2016	Prednicarbate, micronized	15446306	2
Caelo	Prednicarbate, micronized	15446306	2
Fagron	Prednicarbate, micronized	15D15-B03-308161	4
Fagron	Prednicarbate, micronized	15G10-B02	1
Caelo	Prednicarbate, micronized	15D15-B03-308161	1
Fagron	Prednicarbate, micronized	15G10-B02-310848	2
Fagron	Prednicarbate, micronized	15G10-B02-31084	1
Fagron	Prednicarbate, micronized	15G10-B02-314082	2
Fagron	Prednicarbate, micronized	15J22-B04-318930	1
Fagron	Prednicarbate, micronized	15J22-B04-318528	1
Fagron	Prednicarbate, micronized	15J22-B04-316799	1
Fagron	Prednicarbate, micronized	15J22-B04	1
Fagron	Prednicarbate, micronized	15J-B04-316799	1
Fargon	Prednicarbate, micronized	15J22-B04-318930	1
Euro OTC	Prednicarbate, micronized	1601058-01	3
Euro OTC	Prednicarbate, micronized	1605001	1
Euro OTC	Prednicarbate, micronized	1605001-01	2
Euro OTC	Prednicarbate, micronized	1607012-01	2
Sonnenberg-Apotheke	Prednicarbate, micronized	1607012-01	1
Caelo	Prednicarbate, micronized	16087401	2
Caelo	Prednicarbate, micronized	16087408	3
Caelo	Prednicarbate, micronized	16087410	1
Caelo	Prednicarbate, micronized	16A18-B01-322732	1
Fagron	Prednicarbate, micronized	701867-0001	1
Fagron	Prednicarbate, micronized	NT0555M13I23-N04	1
Fagron	Prednicarbate, micronized	NT0780M	1
Fragron	Prednicarbate, micronized	NV0485M	1
Fagron	Prednicarbate, micronized	7061303	1
Fagron	Prednicarbate, micronized	8L10-N12	1
Fagron	Prednicarbate, micronized	9E04-N02	1
Fagron	Prednicarbate, micronized	9G14-N06	1
Caelo	Prednicarbate, micronized	11L23-N07	1
Fagron	Prednicarbate, micronized	11/22-N18	1
Sanacorp	Prednicarbate, micronized	11L23-N07	1
Fagron	Prednicarbate, micronized	11L23N07	1
Caelo	Prednicarbate, micronized	12123607	2
Caelo	Prednicarbate, micronized	12123610	1
Caelo	Prednicarbate, micronized	12383304	2
Caelo	Prednicarbate, micronized	12383301	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Prednicarbate, micronized	12B14-N02	1
Caelo	Prednicarbate, micronized	12383309	1
Fagron	Prednicarbate, micronized	12B14-N02	2
Fagron	Prednicarbate, micronized	12B20-N06	2
Fagron	Prednicarbate, micronized	12D27-N01	2
Fagron	Prednicarbate, micronized	12D27-N04	3
Fagron	Prednicarbate, micronized	12H20-No7	1
Defektur	Prednicarbate, micronized	12D27-N04	1
Euro OTC	Prednicarbate, micronized	1302033-01	1
Euro OTC	Prednicarbate, micronized	1302033-02	2
Fagron	Prednicarbate, micronized	13C25-N02	1
Fagron	Prednicarbate, micronized	13C25-N06	7
Fagron	Prednicarbate, micronized	13F11-N01	3
Fagron	Prednicarbate, micronized	13c25-no6	1
Caelo	Prednicarbate, micronized	13F11-N02	1
Fagron	Prednicarbate, micronized	13F11-No1	2
Fagron	Prednicarbate, micronized	13F11-N01	1
Amos Vital	Prednicarbate, micronized	13G05-N03	1
Gehe	Prednicarbate, micronized	13G05-n03	1
Fagron	Prednicarbate, micronized	13G05-N03	5
Gehe	Prednicarbate, micronized	13I23-N04	1
Fagron	Prednicarbate, micronized	13I23-N04	1
Fagron	Prednicarbate, micronized	15D15-B03308161	1
Fagron	Prednicarbate, micronized	3010E-03595	1
Fagron	Prednicarbate, micronized	12b20-n06	1
Caelo	Prednicarbate, micronized	C0333/1111070	1
Caelo	Prednicarbate, micronized	1213608	1
Gehe	Prednicarbate, micronized	13372403	2
Fagron	Prednicarbate, micronized	NTo555M	1
Fagron	Prednicarbate, micronized	13c25-n06	1

- 55 753 spectra from 335 *Apo-Ident* customers from a total of 20 514 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednicarbate, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednicarbate, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	477	0	75 401
Type B	0	475	35	80 838
Type C	0	248	0	55 753

The substance/substance group *Prednicarbate, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.7421 %)
Type B	100.0000 % (> 99.9853 %)	93.1373 % (> 92.5490 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 97.5806 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20196	20196	0.00	17.91
20700	21572	8.34	19.12
20832	20832	0.00	18.62
20833	20832	2.66	18.63
21368	21368	0.00	19.26
21369	21368	2.09	19.30
21572	21572	0.00	20.20
21610	21610	0.00	20.87
21858	21858	0.00	19.50
22366	22366	0.00	19.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednisolon dihydrogen phosphate dinatrium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20212-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prednisolon dihydrogen phosphate dinatrium; Prednisoloni natrii phosphas; Prednisolonum natrii phosphoricum

Special notes

When selecting the *Prednisolon dihydrogen phosphate dinatrium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednisolon dihy...	11C18-N11	20212	40	AR-12-FG-002990-01
Caelo	Prednisolon dihy...	13304703	20923	40	20130904
Caelo	Prednisolon dihy...	13304704	21412	40	1411052
Fagron	Prednisolon dihy...	14E07-B06-295251	21571	40	20140623

Validation samples

A total of 213 227 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 *Prednisolon dihydrogen phosphate dinatrium*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisolon dihydrogen phosp...	13304704	21412 [†]	20
Caelo	Prednisolon dihydrogen phosp...	13304704	21413	60
Fagron	Prednisolon dihydrogen phosp...	14E07-B06-295251	21571 [†]	20

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 13 *Apo-Ident* customers from 14 batches from the substance/substance group *Prednisolon dihydrogen phosphate dinatrium*.

[†]These spectra were recorded from 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
Fagron	Prednisolon dihydrogen phosp...	13/27-N01	1
Fagron	Prednisolon dihydrogen phosp...	13I27-N01	1
Fagron	Prednisolon dihydrogen phosp...	14G30-B09	1
Fagron	Prednisolon dihydrogen phosp...	14G30-B09-303014	1
Caelo	Prednisolon dihydrogen phosp...	15199603	1
Caelo	Prednisolon dihydrogen phosp...	15199602	1
Caesar & Loretz GmbH Hi...	Prednisolon dihydrogen phosp...	15C19-B05-30885	1
Caelo	Prednisolon dihydrogen phosp...	16174701	1
Fagron	Prednisolon dihydrogen phosp...	11K11-N11	2
Fagron	Prednisolon dihydrogen phosp...	11C18-N11	1
Fagron	Prednisolon dihydrogen phosp...	12H30-N08	2
Fagron	Prednisolon dihydrogen phosp...	13A10-N04	3
Fagron	Prednisolon dihydrogen phosp...	13H19N04	1
Fagron	Prednisolon dihydrogen phosp...	13C26N06	1

- 55 983 spectra from 335 *Apo-Ident* customers from a total of 20 597 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednisolon dihydrogen phosphate dinatrium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolon dihydrogen phosphate dinatrium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	155	5	75 718
Type B	0	100	0	81 248
Type C	0	18	0	55 983

The substance/substance group *Prednisolon dihydrogen phosphate dinatrium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	96.8750 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20212	20212	0.00	44.75
20923	20212	10.88	42.43
21412	21412	0.00	39.69
21571	21412	7.01	47.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednisolone acetate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20089-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prednisolone acetate; Prednisolinum aceticum; Prednisoloni acetas

Special notes

When selecting the *Prednisolone acetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednisolone acetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolone ace...	12091814	20784	60	20120416
Fagron	Prednisolone ace...	12H14-N07	20795	40	20120829
Caelo	Prednisolone ace...	12324502	20877	20	20121112
Euro OTC	Prednisolone ace...	1306040	21096	40	20130812
Caelo	Prednisolone ace...	13262605	21448	40	20130923
Caelo	Prednisolone ace...	13262605	21450	40	20130923

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Prednisolone ace...	1209028-03	21530	40	AR-15-FG-010480-01
Euro OTC	Prednisolone ace...	1512020	22297	30	20160119*
Fagron	Prednisolone ace...	12H14-N07	20795SI	34	20120829
Caelo	Prednisolone ace...	13262605	21448SI	29	20130923
Caelo	Prednisolone ace...	13262605	21450SI	36	20130923
Euro OTC	Prednisolone ace...	1512020	22297SI	29	20160119*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 438 spectra of 12 reference samples from the substance/substance group *Prednisolone acetate*. These samples are listed above in the [calibration samples](#) section.
- 75 440 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 211 spectra of 10 reference samples from the substance/substance group *Prednisolone acetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisolone acetate	13262605	21448 [†]	20
Caelo	Prednisolone acetate	13262605	21450 [†]	20
Euro OTC	Prednisolone acetate	1209028-03	21530 [†]	20
Euro OTC	Prednisolone acetate	1512020	22297 [†]	15
Euro OTC	Prednisolone acetate	1607010	22710	40
Fagron	Prednisolone acetate	12H14-N07	20795SI [†]	15
Caelo	Prednisolone acetate	13262605	21448SI [†]	15
Caelo	Prednisolone acetate	13262605	21450SI [†]	11
Euro OTC	Prednisolone acetate	1512020	22297SI [†]	15
Euro OTC	Prednisolone acetate	1607010	22710SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 137 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 617 spectra from 192 *Apo-Ident* customers from 149 batches from the substance/substance group *Prednisolone acetate*.

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	12324504	11
Gutenberg-Apotheke	Prednisolone acetate	12L11-B40-286915	2
Caelo	Prednisolone acetate	13262601	21
Fagron	Prednisolone acetate	13K20-B04-293970	2
Fagron	Prednisolone acetate	12L11-B40-286915	3
Caelo	Prednisolone acetate	13262609	3
holdermann euro	Prednisolone acetate	1209028-02	3
Caelo	Prednisolone acetate	140601401	1
Caelo	Prednisolone acetate	14175514	6
Fiebig	Prednisolone acetate	11158001	1
Caelo	Prednisolone acetate	12091806	3
Euro OTC	Prednisolone acetate	1209028-02	14
Euro OTC	Prednisolone acetate	1306040-01	21
EUro/AHD	Prednisolone acetate	1306040-01	1
Caelo	Prednisolone acetate	12091813	1
Fagron	Prednisolone acetate	12L05-N01	10
EUro/AHD	Prednisolone acetate	1306040-02	1
Fagron	Prednisolone acetate	13A07-N07	4
Fagron	Prednisolone acetate	13D03-N06	1
Phönix	Prednisolone acetate	13262605	1
Euro OTC	Prednisolone acetate	3707556	1
Caelo	Prednisolone acetate	313I-02106	1
Caelo	Prednisolone acetate	5031511	1
Euro OTC	Prednisolone acetate	1108043-02	14
Fagron	Prednisolone acetate	115B03-B05-308582	1
Euro OTC	Prednisolone acetate	1203028-03	1
Euro OTC	Prednisolone acetate	1209028-03	2
Caelo	Prednisolone acetate	12091804	6
Caelo	Prednisolone acetate	12091810	1
Caelo	Prednisolone acetate	12324503	1
Caelo	Prednisolone acetate	12324506	12
Caelo	Prednisolone acetate	12324508	10
Caelo	Prednisolone acetate	12324514	2
Fagron	Prednisolone acetate	12L11-B40	2
Fagron	Prednisolone acetate	12k20-b04293971	1
Fagron	Prednisolone acetate	12G25-N05	5
Fagron	Prednisolone acetate	12L11-B40-286905	11
Phoenix	Prednisolone acetate	12L11-B40-286905	1
Euro OTC	Prednisolone acetate	1306040-02	15
Symbiotica Spec./Phönix	Prednisolone acetate	1306040-02	1
Caelo	Prednisolone acetate	1306040-02	1
EuRho	Prednisolone acetate	1306040-03	1
Euro OTC	Prednisolone acetate	1306040-1	1
Euro OTC	Prednisolone acetate	1306040101	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	13262602	8
Caelo	Prednisolone acetate	13262603	9
GEHE 03.07.2014	Prednisolone acetate	13262605	1
Caelo	Prednisolone acetate	13262605	15
Caelo	Prednisolone acetate	13262606	5
Euro OTC	Prednisolone acetate	13262606	1
Caelo	Prednisolone acetate	13343112	1
Fagron	Prednisolone acetate	13K20-B04	2
Fagron	Prednisolone acetate	13K20-B04-289494	2
Fagron	Prednisolone acetate	13K20-B04-289495	2
Fagron	Prednisolone acetate	13K20-B04-293971	1
Euro OTC	Prednisolone acetate	1406012-02	1
Euro OTC	Prednisolone acetate	1406014-01	9
Lihua Pharma	Prednisolone acetate	1406014-01	1
Kehr	Prednisolone acetate	1406014-01	1
Caelo	Prednisolone acetate	1406014-02	2
Euro OTC	Prednisolone acetate	1406014-02	9
Caelo	Prednisolone acetate	14175508	14
Caelo	Prednisolone acetate	14175509	3
Caelo	Prednisolone acetate	14175512	1
Caelo	Prednisolone acetate	14175513	9
Caelo	Prednisolone acetate	14175513	1
noweda	Prednisolone acetate	14175513	1
A.H.D.	Prednisolone acetate	14175514	1
Caelo	Prednisolone acetate	14380302	1
Caelo	Prednisolone acetate	14380901	8
Caelo	Prednisolone acetate	14380902	4
Caelo	Prednisolone acetate	14380905	6
Caelo	Prednisolone acetate	14380909	10
Phoenix	Prednisolone acetate	14380905	1
caesar&loretz	Prednisolone acetate	14380909	1
Caelo	Prednisolone acetate	14380910	6
Wolf-Apotheke	Prednisolone acetate	14380911	1
Euro OTC	Prednisolone acetate	1460614-01	1
Noweda 18.05.2015	Prednisolone acetate	14D04-B03-299294	1
Fagron	Prednisolone acetate	14D04-B03-299294	1
Fagron	Prednisolone acetate	14D04B03299295	1
Fagron	Prednisolone acetate	14D04-B03-299295	1
Fagron	Prednisolone acetate	14G30-B13	1
Fagron	Prednisolone acetate	14G30-B13-299293	2
Henan Lihua Pharmaceuti...	Prednisolone acetate	14G30-B13	1
Euro OTC	Prednisolone acetate	1501036	1
Euro OTC	Prednisolone acetate	1501036	1
Euro OTC	Prednisolone acetate	1501036-01	7
Euro OTC	Prednisolone acetate	150103601	1
Euro OTC	Prednisolone acetate	1501036-02	7
Euroo/Gehe	Prednisolone acetate	1501036-02	1
Caelo	Prednisolone acetate	1501038-02	1
Caelo	Prednisolone acetate	15055201	8
15055201	Prednisolone acetate	15055201	1
Beiersdorf AG	Prednisolone acetate	15055201	1
caesar&loretz,Phönix	Prednisolone acetate	15055202	2
Caelo	Prednisolone acetate	15055202	8
Noweda	Prednisolone acetate	15055202	1
Caelo	Prednisolone acetate	15055203	2
Caelo	Prednisolone acetate	15055206	7
Sanacorp	Prednisolone acetate	15055206	1
Euro OTC	Prednisolone acetate	1512020-01	12
Caesar&Loretz GmbH	Prednisolone acetate	15396408	1
Caelo	Prednisolone acetate	15398302	7

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	15396304	1
Beiersdorf AG	Prednisolone acetate	15398302	1
Caelo	Prednisolone acetate	15398303	8
Noweda	Prednisolone acetate	15398303	1
Caelo	Prednisolone acetate	15398304	2
Caelo	Prednisolone acetate	15398306	1
Caelo	Prednisolone acetate	15398307	7
Caelo	Prednisolone acetate	15398401	2
Caelo	Prednisolone acetate	15398402	4
Caelo	Prednisolone acetate	15398408	2
Fagron	Prednisolone acetate	15B03-B05-302566	3
Fagron	Prednisolone acetate	15b03-b05-302564	1
Fagron	Prednisolone acetate	15B03-B05-308582	1
Fagron	Prednisolone acetate	15803-B05	1
Caelo	Prednisolone acetate	16/AKD2	1
Caelo	Prednisolone acetate	16246804	1
Euro OTC	Prednisolone acetate	1607010-01	4
Caelo	Prednisolone acetate	16246801	1
Fagron	Prednisolone acetate	200540-0013	1
Euro OTC	Prednisolone acetate	2215I-02106	1
Bombastus	Prednisolone acetate	2255	1
Euro OTC	Prednisolone acetate	2714U-02106	1
Euro OTC	Prednisolone acetate	5012I-02106	1
Fagron	Prednisolone acetate	K07A20130903M	1
Fragron	Prednisolone acetate	K07A20131101M	1
Fagron	Prednisolone acetate	113Q-02106	1
Euro OTC	Prednisolone acetate	514U2106	1
Caelo	Prednisolone acetate	6021306	1
Euro OTC	Prednisolone acetate	711212106	1
Caelo	Prednisolone acetate	11080403	1
Euro OTC	Prednisolone acetate	1108043-01	4
EuRho/G	Prednisolone acetate	1108043-02	1
Caelo	Prednisolone acetate	11158002	1
Caelo	Prednisolone acetate	11158007	1
Caelo	Prednisolone acetate	11158003	1
Phönix	Prednisolone acetate	11158008	1
Phoenix	Prednisolone acetate	11158007	1
Kehr	Prednisolone acetate	1158007	1
Fagron	Prednisolone acetate	11A31-N03	1
Noweda	Prednisolone acetate	11I09-N08	1
Fagron	Prednisolone acetate	11I09N-08	1
Fagron	Prednisolone acetate	11L21-N03	1
Fagron	Prednisolone acetate	11I09-N08	1
Caelo	Prednisolone acetate	11L21-N03	2
Fargo	Prednisolone acetate	12025-N05	1
Euro OTC	Prednisolone acetate	1209028-01	4
Caelo	Prednisolone acetate	1209028-01	2
Noweda	Prednisolone acetate	1209028-01	1
Caelo	Prednisolone acetate	1209028-02	2
Phönix	Prednisolone acetate	1209028-02	1
Gehe	Prednisolone acetate	1209028-02	1
Caelo	Prednisolone acetate	12091802	8
Anzag, 24.10.2012	Prednisolone acetate	12091802	1
ANZAG	Prednisolone acetate	12091802	2
Caelo	Prednisolone acetate	12091803	6
Fagron	Prednisolone acetate	12091803	1
Caelo	Prednisolone acetate	12091807	7
Caelo	Prednisolone acetate	12091808	4
Alliance Healthcare	Prednisolone acetate	12091807	1
Anzag 01.02.2013	Prednisolone acetate	12091813	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone acetate	12091814	6
Caelo	Prednisolone acetate	12091815	2
Caelo	Prednisolone acetate	12324502	12
Fagron	Prednisolone acetate	12324502	1
Caelo	Prednisolone acetate	12324505	16
Phönix	Prednisolone acetate	12324505	1
Phönix	Prednisolone acetate	12324506	1
Noweda	Prednisolone acetate	12324506	1
AHD, 08.11.13	Prednisolone acetate	12324506	1
Caelo	Prednisolone acetate	12324509	2
Caelo	Prednisolone acetate	1234506	2
Caelo	Prednisolone acetate	1234502	1
Fagron	Prednisolone acetate	12C19-N03	3
Fagron	Prednisolone acetate	12C19-N03	1
FARGON	Prednisolone acetate	12g25-n05	1
Fagron	Prednisolone acetate	12H14-N07	3
Gehe	Prednisolone acetate	12H14-N07	1
Fagron	Prednisolone acetate	12J10-N05	1
Fagron	Prednisolone acetate	12J10/N05	1
FARGON	Prednisolone acetate	12105-n01	1
Symbiotika/Anzag	Prednisolone acetate	1306040-01	1
Caelo	Prednisolone acetate	1306040-01	1
Euro OTC	Prednisolone acetate	130604002	1
Caesar&loretz,Phoenix	Prednisolone acetate	13262606	1
Fagron	Prednisolone acetate	13a07n07	1
Caelo	Prednisolone acetate	13A07-N07	2
A.H. 23.05.13 ek: 5,40EUR	Prednisolone acetate	13A07-N07	1
Anzag	Prednisolone acetate	13A07N07	1
Caelo	Prednisolone acetate		2
Fargon	Prednisolone acetate	13A07-N07	1
Caesar&loretz,Phoenix	Prednisolone acetate	14175513	1
Euro OTC	Prednisolone acetate	200540	1
apo-ident	Prednisolone acetate	1512020-01	1
Euro OTC	Prednisolone acetate	2413Q02106	1
Euro OTC	Prednisolone acetate	2507212106	1
Caelo	Prednisolone acetate	27051301	1
Caelo	Prednisolone acetate	4313A-02106	1
Euro OTC	Prednisolone acetate	2902212106	1
Euro OTC	Prednisolone acetate	K07A20140304M	1
Euro OTC	Prednisolone acetate	PAC-BLT003/0812	1
Gehe	Prednisolone acetate	13262609	1
Fagron	Prednisolone acetate	12H14-N07	1

- 55 384 spectra from 334 *Apo-Ident* customers from a total of 20 468 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednisolone acetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone acetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The

following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	438	0	75 440
Type B	0	211	0	81 137
Type C	0	584	33	55 384

The substance/substance group *Prednisolone acetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6301 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.1564 %)
Type C	100.0000 % (> 99.8622 %)	94.6515 % (> 94.1653 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20784	22297	9.09	45.50
20795	22297	8.24	37.53
20877	22297	5.42	42.91
21096	22297	7.10	41.02
21448	22297	10.80	39.11
21450	22297	12.46	36.02
21530	21530	0.00	37.39
22297	22297	0.00	42.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednisolone hydrogen succinate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20838-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prednisolone hydrogen succinate; Prednisoloni hydrogenosuccinas

Special notes

When selecting the *Prednisolone hydrogen succinate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednisolone hydrogen succinate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prednisolone hyd...	12A20-N11	20838	40	20120126
Fagron	Prednisolone hyd...	13D16-N11	20956	40	1509250
Fagron	Prednisolone hyd...	14G29-B07-304733	22652	40	1701370

Validation samples

A total of 213 227 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 *Prednisolone hydrogen succinate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Prednisolone hydrogen succinate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednisolone hydrogen succin...	14G29-B07-304733	22723	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Prednisolone hydrogen succinate*.

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone hydrogen succin...	12A20-N11	1
Phönix	Prednisolone hydrogen succin...	13H24-N04	1
Fagron	Prednisolone hydrogen succin...	14G29-B07-304733	1
Caelo	Prednisolone hydrogen succin...	15C11-B05-305533	1
Caelo	Prednisolone hydrogen succin...	19081502	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednisolone hydrogen succinate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone hydrogen succinate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	5	0	55 996

The substance/substance group *Prednisolone hydrogen succinate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20838	22652	7.28	30.89
20956	20956	0.00	32.95
22652	22652	0.00	31.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednisolone, micronized**
 Substance class APIs & excipients, solid
 Report date 12/04/2017
 Report number 20773-2017-04-12
 Executing company HiperScan GmbH
 Weißeritzstraße 3
 01067 Dresden
 Germany

Relevant substance names

Prednisolone, micronized; Prednisolonum micronisatum

Special notes

When selecting the *Prednisolone, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednisolone, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolone, mi...	12324202	20773	40	20121113
Caelo	Prednisolone, mi...	12324226	21303	39	1411271
Caelo	Prednisolone, mi...	13343105	21449	40	1411232
Euro OTC	Prednisolone, mi...	1212021-02	21604	40	1411270
Fagron	Prednisolone, mi...	13H07-B02-285592	21660	40	20130909
Euro OTC	Prednisolone, mi...	1501047-01	21849	40	AR-15-FG-015509-01

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisolone, mi...	154000	22435	40	20160225*
Caelo	Prednisolone, mi...	161343	22467	40	20160601*
Fagron	Prednisolone, mi...	14I10-B03-302263	22651	40	20141020
Euro OTC	Prednisolone, mi...	1607011	22709	40	20160818*
Caelo	Prednisolone, mi...	15400002	22783	40	20160225
Fagron	Prednisolone, mi...	16C15-B01-320761	22803	40	20160407
Euro OTC	Prednisolone, mi...	1212021-02	21604SI	33	1411270
Fagron	Prednisolone, mi...	13H07-B02-285592	21660SI	40	20130909
Euro OTC	Prednisolone, mi...	1501047-01	21849SI	20	AR-15-FG-015509-01
Caelo	Prednisolone, mi...	154000	22435SI	39	20160225*
Caelo	Prednisolone, mi...	161343	22467SI	32	20160601*
Fagron	Prednisolone, mi...	14I10-B03-302263	22651SI	40	20141020
Euro OTC	Prednisolone, mi...	1607011	22709SI	40	20160818*
Caelo	Prednisolone, mi...	15400002	22783SI	40	20160225
Fagron	Prednisolone, mi...	16C15-B01-320761	22803SI	36	20160407

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 799 spectra of 21 reference samples from the substance/substance group *Prednisolone, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 079 spectra from a total of 1564 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 350 spectra of 15 reference samples from the substance/substance group *Prednisolone, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prednisolone, micronized	1108055-04	20855	30
Fagron	Prednisolone, micronized	pending	21008	30
Fagron	Prednisolone, micronized	9K05-N02	21019	30
Caelo	Prednisolone, micronized	13343105	21449 [†]	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Prednisolone, micronized	1212021-02	21604 [†]	20
Fagron	Prednisolone, micronized	13H07-B02-285592	21660 [†]	20
Euro OTC	Prednisolone, micronized	1501047-01	21849 [†]	20
Caelo	Prednisolone, micronized	154000	22435 [†]	20
Caelo	Prednisolone, micronized	161343	22467 [†]	20
Caelo	Prednisolone, micronized	13343105	21451SI	60
Euro OTC	Prednisolone, micronized	1212021-02	21604SI [†]	15
Fagron	Prednisolone, micronized	13H07-B02-285592	21660SI [†]	20
Euro OTC	Prednisolone, micronized	1501047-01	21849SI [†]	10
Caelo	Prednisolone, micronized	154000	22435SI [†]	20
Caelo	Prednisolone, micronized	161343	22467SI [†]	15

- 80 998 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 584 spectra from 196 *Apo-Ident* customers from 161 batches from the substance/substance group *Prednisolone, micronized*.

Supplier	Substance	Batch	Spectra
Euro OTC	Prednisolone, micronized	1108055-04	22
Euro OTC	Prednisolone, micronized	501047-01	1
Fagron	Prednisolone, micronized	613Q-02105	1
Caelo	Prednisolone, micronized	10196606	1
Caelo	Prednisolone, micronized	10196626	7
Euro OTC	Prednisolone, micronized	110805502	1
Euro OTC	Prednisolone, micronized	121021-01	2
Euro OTC	Prednisolone, micronized	1212021-01	20
Caelo	Prednisolone, micronized	1212021-01	1
Euro OTC	Prednisolone, micronized	1212021-02	16
Gehe	Prednisolone, micronized	1212021-01	4
Euro OTC	Prednisolone, micronized	121202101	1
Tianyao Pharma/Phönix	Prednisolone, micronized	1212021-01	1
euroct/gehe	Prednisolone, micronized	1212021-01	2
Caelo	Prednisolone, micronized	121202102	1
Euro OTC	Prednisolone, micronized	121202102	1
Euro OTC	Prednisolone, micronized	1212021-03	9
Caelo	Prednisolone, micronized	1212021-03	4
Caelo	Prednisolone, micronized	12324213	7
Euro/ Sanacorp	Prednisolone, micronized	121202103	1
AHD	Prednisolone, micronized	121202103	1
Caelo	Prednisolone, micronized	12324220	2
Caelo	Prednisolone, micronized	12324217	7
Caelo	Prednisolone, micronized	12324221	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
Caelo	Prednisolone, micronized	12324226	9
Euro OTC	Prednisolone, micronized	1314Q2105	1
Caelo	Prednisolone, micronized	133414	1
Caelo	Prednisolone, micronized	13343104	7
Euro OTC	Prednisolone, micronized	13343104	1
Caelo	Prednisolone, micronized	13343105	6
Phönix Gotha	Prednisolone, micronized	13343105	1
Caelo	Prednisolone, micronized	13343106	8
Fagron	Prednisolone, micronized	13343106	1
Gehe	Prednisolone, micronized	13343107	1
Caelo	Prednisolone, micronized	13343111	4
Caelo	Prednisolone, micronized	13343107	1
Phönix Gotha	Prednisolone, micronized	13343111	1
Phönix Gotha	Prednisolone, micronized	13343112	2
Caelo	Prednisolone, micronized	13343112	1
Caesar&Loretz GmbH/Anzag	Prednisolone, micronized	13343112	1
Caelo	Prednisolone, micronized	13343113	1
Caelo	Prednisolone, micronized	13343114	3
Caelo	Prednisolone, micronized	13343115	6
Berkel AHK	Prednisolone, micronized	13343115	1
Caelo	Prednisolone, micronized	13343116	2
Fagron	Prednisolone, micronized	13A07-N14	8
Fagron	Prednisolone, micronized	13A07N14	1
Fagron	Prednisolone, micronized	13E15-N06	13
Fagron	Prednisolone, micronized	13E13-N06	1
Fagron	Prednisolone, micronized	13H07-B020	1
Fagron	Prednisolone, micronized	13H07-B02	1
Caelo	Prednisolone, micronized	13H07-B02-285590	1
Fagron	Prednisolone, micronized	13H07-B02-285590	1
Fagron	Prednisolone, micronized	13H07-B02-285592	3
Fagron	Prednisolone, micronized	13H07-B02-285593	1
Fagron	Prednisolone, micronized	13H07-B02-285593	3
Fagron	Prednisolone, micronized	13J28-B06-289670	3
Sanacorp	Prednisolone, micronized	13j28-b06-289670	1
Fagron	Prednisolone, micronized	13J28-B06	1
Fagron	Prednisolone, micronized	14/10-B03	1
Fagron	Prednisolone, micronized		2
Caelo	Prednisolone, micronized	14/10B03302265	1
Fagron	Prednisolone, micronized	14/10-B03-302265	3
Fagron	Prednisolone, micronized	14/10B03302265	1
Fagron	Prednisolone, micronized	14/10-B03-302266	2
Fagron	Prednisolone, micronized	14/10-B03-302269	1
Fagron	Prednisolone, micronized	1410-B03-302269	1
Fagron	Prednisolone, micronized	1410-B03	1
Fischar/Gehe	Prednisolone, micronized	14A30-B02-294968	1
Fagron	Prednisolone, micronized	14A30-B02-294968	1
Phönix	Prednisolone, micronized	14B18-B05-294966	1
Caelo	Prednisolone, micronized	14A30-B02-294968	1
Fagron	Prednisolone, micronized	14B18-B05-294966	7
Caelo	Prednisolone, micronized	14B18-B05-294966	2
Fagron	Prednisolone, micronized	14B18-B05-294969	2
Fagron	Prednisolone, micronized	14B18-Bo5-294966	1
Fagron	Prednisolone, micronized	14I10-B03-302266	1
Fagron	Prednisolone, micronized	14G30-B14-302262	3
Fagron	Prednisolone, micronized	14G30-B14	1
Fagron	Prednisolone, micronized	14I10-B03	2
Fagron	Prednisolone, micronized	14i10-b03-302269	1
Fagron	Prednisolone, micronized	14I10-B03-302269	1
Euro OTC	Prednisolone, micronized	1501047-01	9
Euro OTC	Prednisolone, micronized	150104701	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone, micronized	15055101	3
Bombastus	Prednisolone, micronized	1501047-02	1
Caelo	Prednisolone, micronized	15055102	3
Caelo	Prednisolone, micronized	152006105	1
Caelo	Prednisolone, micronized	15206101	4
Caelo	Prednisolone, micronized	15206102	8
Noweda	Prednisolone, micronized	15206101	1
Caelo	Prednisolone, micronized	15206103	5
Caelo	Prednisolone, micronized	15206105	3
Caelo	Prednisolone, micronized	15206108	5
Caelo	Prednisolone, micronized	15400002	1
Caelo	Prednisolone, micronized	15400003	6
Phoenix	Prednisolone, micronized	15400003	1
Caelo	Prednisolone, micronized	15400004	1
Caelo	Prednisolone, micronized	1540003	1
Fagron	Prednisolone, micronized	15D14-B01-308425	2
Fagron	Prednisolone, micronized	15K03B04314226	1
Fagron	Prednisolone, micronized	15K03-B04-314358	1
Fagron	Prednisolone, micronized	15K03-B04-314226	3
Fagron	Prednisolone, micronized	15K03-B04	1
Fagron	Prednisolone, micronized	15k03-b04-314226	1
Fagron	Prednisolone, micronized	15K03-B04-314869	1
Fagron	Prednisolone, micronized	16A20-B03-316420	1
Fagron	Prednisolone, micronized	16A20-B03	1
Fagron	Prednisolone, micronized	16c15-B01-320761	1
Caelo	Prednisolone, micronized	19081504	1
Caelo	Prednisolone, micronized		1
Caelo	Prednisolone, micronized	4712I-02105	1
Caelo	Prednisolone, micronized	k04c20121219	1
Caelo	Prednisolone, micronized	P142/14	1
EuRho	Prednisolone, micronized	1012012-02	2
Caelo	Prednisolone, micronized	9244213	1
EuRho	Prednisolone, micronized	1012012-01	1
Caelo	Prednisolone, micronized	1012012-02	1
Caelo	Prednisolone, micronized	10196611	3
Caelo	Prednisolone, micronized	10196614	1
Kehr	Prednisolone, micronized	10196622	1
Caelo	Prednisolone, micronized	10196622	2
Caelo	Prednisolone, micronized	10196623	1
Caelo	Prednisolone, micronized	10196625	1
Phönix Gotha	Prednisolone, micronized	10196626	2
Caelo	Prednisolone, micronized	10196627	11
Caelo	Prednisolone, micronized	11/26-N04	1
Euro OTC	Prednisolone, micronized	1108055-02	5
Euro OTC	Prednisolone, micronized	1108055-03	12
Fagron	Prednisolone, micronized	11G22-N08	2
Fagron	Prednisolone, micronized	11D13-N05	1
Fagron	Prednisolone, micronized	11J26-N04	3
Phoenix	Prednisolone, micronized	11j26-N04	2
Noweda	Prednisolone, micronized	12C22-N05	1
Caelo	Prednisolone, micronized	12171301	5
Caelo	Prednisolone, micronized	1511011	1
Fagron	Prednisolone, micronized	12C22-N05	8
Gehe	Prednisolone, micronized	12C22-N05	1
A.H. 05.03.13 ek: 14,08EUR	Prednisolone, micronized	12D30-N04	1
Caelo	Prednisolone, micronized	9193501	1
Noweda	Prednisolone, micronized	9244213	1
europharma	Prednisolone, micronized	1002001240	1
Alliance Health 04.01.2...	Prednisolone, micronized	1012012-01	1
Caelo	Prednisolone, micronized	1019611	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Prednisolone, micronized	10196604	1
Caelo	Prednisolone, micronized	10196619	1
Noweda	Prednisolone, micronized	10196626	2
Euro OTC	Prednisolone, micronized	1108055-01	1
Sanacorp	Prednisolone, micronized	1108055-03	1
Europharm/Otto	Prednisolone, micronized	1108055-03	1
EuRho	Prednisolone, micronized	1108055-03	2
Europharm/Otto	Prednisolone, micronized	1108055-04	5
Apotheke Mildenau	Prednisolone, micronized	1108055-04	3
EuRho/Jenne	Prednisolone, micronized	1108055-04	2
Euro OTC	Prednisolone, micronized	110805504	6
Caelo	Prednisolone, micronized	1108055-04	1
Sanacorp	Prednisolone, micronized	110805504	1
Euro OTC	Prednisolone, micronized	110855-02	1
Sanacorp	Prednisolone, micronized	1212021	1
Caelo	Prednisolone, micronized	12171302	1
Anzag 15.10.12	Prednisolone, micronized	12171303	1
Gehe	Prednisolone, micronized	12171302	1
Caelo	Prednisolone, micronized	12171303	3
Caelo	Prednisolone, micronized	12171306	2
Phoenix, 03.09.2012	Prednisolone, micronized	12185702	1
Phönix Gotha	Prednisolone, micronized	12185702	1
Caelo	Prednisolone, micronized	12185702	2
Caelo	Prednisolone, micronized	1232417	1
Phönix Gotha	Prednisolone, micronized	1232417	1
Fagron	Prednisolone, micronized	12324202	1
Caelo	Prednisolone, micronized	12324202	10
Caelo	Prednisolone, micronized	12324203	6
Phönix Gotha	Prednisolone, micronized	12324204	1
Caelo	Prednisolone, micronized	12324204	4
Caelo	Prednisolone, micronized	12324205	14
Caesar & Loretz GmbH	Prednisolone, micronized	12324205	1
Caelo	Prednisolone, micronized	12324206	1
Caelo	Prednisolone, micronized	12324207	4
Phönix Gotha	Prednisolone, micronized	12324207	1
Gehe 03.07.2013	Prednisolone, micronized	12324207	1
Phönix Gotha	Prednisolone, micronized	12324213	1
Caelo	Prednisolone, micronized	12324216	15
Phönix	Prednisolone, micronized	12324216	1
Phönix Gotha	Prednisolone, micronized	12324217	1
Gehe	Prednisolone, micronized	12324219	2
Caelo	Prednisolone, micronized	12324219	9
Sonnenberg-Apotheke	Prednisolone, micronized	12324219	1
Caesar & Loretz GmbH	Prednisolone, micronized	12324219	1
Caelo	Prednisolone, micronized	123242216	1
Caelo	Prednisolone, micronized	1234205	1
Fagron	Prednisolone, micronized	12c22-N05	2
FARGON	Prednisolone, micronized	12c22-n05	1
Fagron	Prednisolone, micronized	12D30-N04	12
Fagron	Prednisolone, micronized	12D30N04	1
Fagron	Prednisolone, micronized	12C22N05	1
Fagron	Prednisolone, micronized	12D30-N04	1
Fagron	Prednisolone, micronized	12D30-no4	1
Fagron	Prednisolone, micronized	12K14-N03	11
Unisan	Prednisolone, micronized	12K14N-N03	1
Fagron	Prednisolone, micronized	12K14-N03	1
Gehe	Prednisolone, micronized	13A07-N14	2
Caelo	Prednisolone, micronized	13A07-N14	2
Phönix	Prednisolone, micronized	13A07N14	1
Caelo	Prednisolone, micronized	13e15-n06	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Prednisolone, micronized	13E15-N06	2
Fargron	Prednisolone, micronized	13E15-N06	1
Caelo	Prednisolone, micronized	13E15-N06	4
Sanacorp	Prednisolone, micronized	13E15-N06	1
AHD, 28.11.13	Prednisolone, micronized	13E15-N06	1
Phönix	Prednisolone, micronized	15206103	1
Fagron	Prednisolone, micronized	13E15-N06	1
Gehe	Prednisolone, micronized	13E15-No6	1
Caelo	Prednisolone, micronized	2413Q02105	1
Caelo	Prednisolone, micronized	20021303	1
Caelo	Prednisolone, micronized	26131-02105	1
Caelo	Prednisolone, micronized	411092-1-P	1
Fagron	Prednisolone, micronized	4313E-02105	1
Euro OTC	Prednisolone, micronized	NEPL110103	1
Fagron	Prednisolone, micronized	Ch12D30-N04	1
Caelo	Prednisolone, micronized	4513U2105	1
Fargron	Prednisolone, micronized	FP01409P	1
Tianyao Pharma/Phönix	Prednisolone, micronized	NEPL110103	1
Fagron	Prednisolone, micronized	K04C20121006	1
Fagron	Prednisolone, micronized	nep1120802	1
Fagron	Prednisolone, micronized	NEPL151202	1
Fagron	Prednisolone, micronized	11g22-n08	1

- 55 417 spectra from 335 *Apo-Ident* customers from a total of 20 454 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednisolone, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisolone, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	799	0	75 079
Type B	0	350	0	80 998
Type C	0	569	15	55 417

The substance/substance group *Prednisolone, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 99.2491 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.2857 %)
Type C	100.0000 % (> 99.8622 %)	97.4315 % (> 96.9178 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20773	21303	17.76	36.26
21303	21303	0.00	29.39
21449	21449	0.00	29.05
21604	21604	0.00	32.69
21660	21449	4.02	29.78
21849	21849	0.00	18.47
22435	22435	0.00	23.86
22467	22467	0.00	32.20
22651	21303	12.96	39.02
22709	22709	0.00	21.94
22783	22709	8.87	27.49
22803	21604	6.99	29.64

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prednisone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20002-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prednisone; Prednisonum

Special notes

When selecting the *Prednisone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prednisone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Prednisone	72123189	20002	30	I 2009 000 274
Caelo	Prednisone	12232716	21408	40	20120829
Caelo	Prednisone	12232716	21409	40	20120829
Euro OTC	Prednisone	1401042-02	21616	40	1605276
Euro OTC	Prednisone	1604051	22557	40	20160523*
Caelo	Prednisone	12232716	21408SI	40	20120829
Caelo	Prednisone	12232716	21409SI	40	20120829
Euro OTC	Prednisone	1604051	22557SI	40	20160523*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 8 reference samples from the substance/substance group *Prednisone*. These samples are listed above in the [calibration samples](#) section.
- 75 568 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 201 spectra of 8 reference samples from the substance/substance group *Prednisone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Prednisone	72123189	20002 [†]	1
Caelo	Prednisone	10037803	20109	40
Caelo	Prednisone	12232716	21408 [†]	20
Caelo	Prednisone	12232716	21409 [†]	20
Fagron	Prednisone	13C14-B40-289148	21573	60
Euro OTC	Prednisone	1401042-02	21616 [†]	20
Caelo	Prednisone	12232716	21408SI [†]	20
Caelo	Prednisone	12232716	21409SI [†]	20

- 81 147 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

provided by the customer regarding manufacturer and batch number.

- 27 spectra from 16 *Apo-Ident* customers from 22 batches from the substance/substance group *Prednisone*.

Supplier	Substance	Batch	Spectra
Caelo	Prednisone	204312107	1
Caelo	Prednisone	10037817	2
Caelo	Prednisone	10037803	1
Caelo	Prednisone	10037826	1
Phönix	Prednisone	11D08-N05	1
Caelo	Prednisone	12177604	2
Caelo	Prednisone	12232705	2
Caelo	Prednisone	12232713	1
Gehe	Prednisone	12232714	1
Fagron	Prednisone	12E02-N01	1
Fagron	Prednisone	12E02-N10	1
Caelo	Prednisone	13262302	1
Gehe	Prednisone	12L14-M03	1
Caelo	Prednisone	13262304	1
Fagron	Prednisone	13C13-N08	1
Gehe	Prednisone	13C13-N08	1
Caelo	Prednisone	15218602	2
Fagron	Prednisone	21021401	1
Caelo	Prednisone	15218606	1
Caelo	Prednisone	2114Q2107	1
Caelo	Prednisone	28021401	1
Euro/phönix	Prednisone	140104-02	1
Caelo	Prednisone	28021403	1

- 55 974 spectra from 335 *Apo-Ident* customers from a total of 20 589 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prednisone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prednisone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	75 568
Type B	0	201	0	81 147
Type C	0	27	0	55 974

The substance/substance group *Prednisone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0149 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 77.7778 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20002	20002	0.00	32.11
21408	21616	9.80	22.02
21409	21616	5.11	26.98
21616	21616	0.00	27.00
22557	22557	0.00	32.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pregnenolone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20721-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pregnenolone; Pregnenolonum

Special notes

When selecting the *Pregnenolone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pregnenolone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Pregnenolone	1204040-01	20721	40	1404311
Euro OTC	Pregnenolone	1312007-01	21679	40	8985
Fagron	Pregnenolone	15B11-B07-310278	22355	30	9338
Euro OTC	Pregnenolone	1602001	22375	30	20160208*
Euro OTC	Pregnenolone	1612019	22979	40	20170131*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Pregnenolone*. These samples are listed above in the [calibration samples](#) section.
- 75 698 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 130 spectra of 5 reference samples from the substance/substance group *Pregnenolone*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Pregnenolone	2903030-02	20612	40
Euro OTC	Pregnenolone	1312007-01	21679 [†]	20
Fagron	Pregnenolone	15B11-B07-310278	22355 [†]	15
Euro OTC	Pregnenolone	1602001	22375 [†]	15
Euro OTC	Pregnenolone	1606028	22706	40

- 81 218 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 13 spectra from 5 *Apo-Ident* customers from 11 batches from the substance/substance group *Pregnenolone*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Pregnenolone	1402025-01	1
Fagron	Pregnenolone	14B18-B04-291917	1
NWM CHina	Pregnenolone	PR150329	1
NWM Shandong Northwest ...	Pregnenolone	PRN151219	1
Euro OTC	Pregnenolone	1312007-01	1
Audor Pharma	Pregnenolone	AP10L10-M01P	1
Haihang Industry	Pregnenolone	20140329	1
Audor Pharma	Pregnenolone	AP1109007-01P	3
KS Pharma	Pregnenolone	ZH-111119	1
Koisser	Pregnenolone	ZH-130802	1
Koisser Pharma	Pregnenolone	ZH-131001	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 600 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pregnenolone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pregnenolone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	75 698
Type B	0	130	0	81 218
Type C	0	13	0	55 988

The substance/substance group *Pregnenolone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.3846 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20721	20721	0.00	20.51
21679	21679	0.00	18.45
22355	22355	0.00	22.61
22375	22375	0.00	18.59
22979	22979	0.00	18.44

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Prilocaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21048-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Prilocaine hydrochloride; Prilocaini hydrochloridum; Prilocainum hydrochloricum

Special notes

When selecting the *Prilocaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Prilocaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Prilocaine hydro...	13I02-N03	21048	40	1403257
Fagron	Prilocaine hydro...	13I02-N03	21050	40	20130918
Fagron	Prilocaine hydro...	14H13-B03-297591	21800	40	AR-15-FG-016323-01
Caelo	Prilocaine hydro...	15230305	21926	40	20150723

Validation samples

A total of 213 227 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 *Prilocaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Prilocaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Prilocaine hydrochloride	14H13-B03-297591	21800 [†]	20
Caelo	Prilocaine hydrochloride	15230305	21926 [†]	20
Fagron	Prilocaine hydrochloride	14H13-B03-297591	21800SI	60
Caelo	Prilocaine hydrochloride	15230305	21926SI	60

- 81 188 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Prilocaine hydrochloride*.

[†]These spectra were recorded from 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
GEHE 02.05.2013	Prilocaine hydrochloride		1
Fagron	Prilocaine hydrochloride	13I032-N03	1

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Prilocaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Prilocaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	125	35	81 188
Type C	0	2	0	55 999

The substance/substance group *Prilocaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	78.1250 % (> 76.2500 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21048	21048	0.00	48.35
21050	21048	1.72	48.40
21800	21800	0.00	47.39
21926	21800	7.77	47.01

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Procaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20042-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Procaine hydrochloride; Procaini hydrochloridum; Procainum hydrochloricum

Special notes

When selecting the *Procaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Procaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Procaine hydroch...	08L11-N12	20042	30	I 2009 000 346
Euro OTC	Procaine hydroch...	1003001-01	20542	40	AR-13-FG-009020-01
Caelo	Procaine hydroch...	13109906	21785	40	AR-15-FG-008935-01
Caelo	Procaine hydroch...	15006906	22247	40	20150209
Fagron	Procaine hydroch...	13F12-B40-301798	22260	40	20141210
Euro OTC	Procaine hydroch...	1601014	22306	40	20160203*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 6 reference samples from the substance/substance group *Procaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 648 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Procaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Procaine hydrochloride	13109906	21785 [†]	20
Caelo	Procaine hydrochloride	15006906	22247 [†]	20
Fagron	Procaine hydrochloride	13F12-B40-301798	22260 [†]	20
Euro OTC	Procaine hydrochloride	1601014	22306 [†]	20
Caelo	Procaine hydrochloride	161378	22624	40

- 81 228 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 71 spectra from 43 *Apo-Ident* customers from 43 batches from the substance/substance group *Procaine hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Procaine hydrochloride	7011506	1
Euro OTC	Procaine hydrochloride	1104012-04	5
Alliance Health 09.09.2...	Procaine hydrochloride	1104012-05	1
Euro OTC	Procaine hydrochloride	1104012-05	4
Fagron	Procaine hydrochloride	13I09-N08	1
Caelo	Procaine hydrochloride	1310880	1
Caelo	Procaine hydrochloride	13109916	1
Euro OTC	Procaine hydrochloride	1405027-01	4
Caelo	Procaine hydrochloride	13F12-B40-302510	1
Fagron	Procaine hydrochloride	13F12-B40	1
Euro OTC	Procaine hydrochloride	1405027-02	1
Caelo	Procaine hydrochloride	14164408	1
Caelo	Procaine hydrochloride	14164409	3
Euro OTC	Procaine hydrochloride	1601014-01	1
siehe WE-Prüfprotokoll	Procaine hydrochloride	39/12	1
Caelo	Procaine hydrochloride	15006902	1
Caelo	Procaine hydrochloride	15006913	1
Gatt-Koller / Phoenix	Procaine hydrochloride	4428/10122714	2
Caelo	Procaine hydrochloride	60998127	2
Phönix Gotha	Procaine hydrochloride	190311	1
Euro OTC	Procaine hydrochloride	1003001-01	1
Caelo	Procaine hydrochloride	10159723	1
Kehr	Procaine hydrochloride	10159721	1
Caelo	Procaine hydrochloride	10159721	1
Caelo	Procaine hydrochloride	10159729	1
Gehe	Procaine hydrochloride	10159730	1
Fagron	Procaine hydrochloride	10H11-N25	1
Euro OTC	Procaine hydrochloride	1104012-01	1
Euro OTC	Procaine hydrochloride	1104012-03	4
Phönix 08.01.2014	Procaine hydrochloride	1104012-03	1
Gehe	Procaine hydrochloride	1104012-03	1
Caelo	Procaine hydrochloride	11370206	1
Caelo	Procaine hydrochloride	11370216	2
Koisser	Procaine hydrochloride	11370218	1
Caelo	Procaine hydrochloride	11370215	1
Caelo	Procaine hydrochloride	11370203	1
Caelo	Procaine hydrochloride	11370219	1
Caelo	Procaine hydrochloride	12177801	3
Caelo	Procaine hydrochloride	11370204	1
Herstellung	Procaine hydrochloride	12177801	1
Fagron	Procaine hydrochloride	12I10-N07	2
China Medica	Procaine hydrochloride	13109911	1
Caelo	Procaine hydrochloride	13109915	1
Caelo	Procaine hydrochloride	13109908	2
Caelo	Procaine hydrochloride	131099903	1
Caelo	Procaine hydrochloride	13I09-N08	1
Euro OTC	Procaine hydrochloride	200644	1
Fagron	Procaine hydrochloride	1651212	1
Anzag	Procaine hydrochloride	60998058	1

- 55 930 spectra from 335 *Apo-Ident* customers from a total of 20 568 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Procaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Procaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	230	0	75 648
Type B	0	120	0	81 228
Type C	0	70	1	55 930

The substance/substance group *Procaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.3913 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	98.5915 % (> 94.3662 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20042	20042	0.00	40.37
20542	20542	0.00	39.19
21785	21785	0.00	38.80
22247	22306	5.73	38.62
22260	22306	5.27	38.13
22306	22306	0.00	38.95

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Progesterone, micronized**
 Substance class APIs & excipients, solid
 Report date 12/04/2017
 Report number 20024-2017-04-12
 Executing company HiperScan GmbH
 Weißeritzstraße 3
 01067 Dresden
 Germany

Relevant substance names

Progesterone, micronized; Progesteronum micronisatum

Special notes

When selecting the *Progesterone, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Progesterone, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Progesterone, mi...	71498458	20024	60	I 2009 000 287
Fagron	Progesterone, mi...	12A19-N04	20546	40	AR-13-FG-009119-01
Euro OTC	Progesterone, mi...	1111053-01	20718	30	20120119
Euro OTC	Progesterone, mi...	1506033	21868	20	0000010482
Euro OTC	Progesterone, mi...	1506034	21870	40	0000010483
Euro OTC	Progesterone, mi...	1509008	21907	40	20150914*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Progesterone, mi...	1511008	22226	40	20151119*
Euro OTC	Progesterone, mi...	1601009	22301	30	20160128*
Euro OTC	Progesterone, mi...	1601001	22303	30	20160128*
Euro OTC	Progesterone, mi...	1603004	22525	40	20160406*
Fagron	Progesterone, mi...	16A20-B02-319103	22830	40	20160209
Caelo	Progesterone, mi...	15319601	22831	40	20151014
Euro OTC	Progesterone, mi...	1506033	21868SI	20	0000010482
Euro OTC	Progesterone, mi...	1601009	22301SI	30	20160128*
Fagron	Progesterone, mi...	16A20-B02-319103	22830SI	40	20160209

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 540 spectra of 15 reference samples from the substance/substance group *Progesterone, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 338 spectra from a total of 1564 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 886 spectra of 27 reference samples from the substance/substance group *Progesterone, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Progesterone, micronized	80277304	21018	30
Euro OTC	Progesterone, micronized	1506033	21868 [†]	40
Euro OTC	Progesterone, micronized	1506034	21870 [†]	20
Euro OTC	Progesterone, micronized	1509008	21907 [†]	20
Euro OTC	Progesterone, micronized	1511008	22226 [†]	20
Euro OTC	Progesterone, micronized	1601009	22301 [†]	15
Euro OTC	Progesterone, micronized	1601001	22303 [†]	15
Euro OTC	Progesterone, micronized	1603012	22529	40
Euro OTC	Progesterone, micronized	1605013	22556	40
Euro OTC	Progesterone, micronized	1606033	22704	40

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Progesterone, micronized	1605032	22705	40
Euro OTC	Progesterone, micronized	1609016	22788	40
Euro OTC	Progesterone, micronized	1609001	22819	40
Euro OTC	Progesterone, micronized	1506033	21868SI [†]	30
Euro OTC	Progesterone, micronized	1506034	21870SI	59
Euro OTC	Progesterone, micronized	1509008	21907SI	53
Euro OTC	Progesterone, micronized	1511008	22226SI	27
Euro OTC	Progesterone, micronized	1601009	22301SI [†]	15
Euro OTC	Progesterone, micronized	1601001	22303SI	44
Euro OTC	Progesterone, micronized	1603004	22525SI	31
Euro OTC	Progesterone, micronized	1603012	22529SI	29
Euro OTC	Progesterone, micronized	1605013	22556SI	30
Euro OTC	Progesterone, micronized	1606033	22704SI	30
Euro OTC	Progesterone, micronized	1605032	22705SI	38
Euro OTC	Progesterone, micronized	1609016	22788SI	30
Euro OTC	Progesterone, micronized	1609001	22819SI	30
Caelo	Progesterone, micronized	15319601	22831SI	40

- 80 462 spectra from a total of 1932 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 354 spectra from 116 *Apo-Ident* customers from 146 batches from the substance/substance group *Progesterone, micronized*.

Supplier	Substance	Batch	Spectra
Caelo	Progesterone, micronized	7101401	1
Caelo	Progesterone, micronized	12195828	1
Caelo	Progesterone, micronized	12195924	3
Caelo	Progesterone, micronized	12195928	10
Caelo	Progesterone, micronized	12195926	19
keine Angabe	Progesterone, micronized	1304040-01	1
Changzhou Jiaerke Pharma	Progesterone, micronized	1308015-01	1
Euro OTC	Progesterone, micronized	1304040-02	3
Caelo	Progesterone, micronized	13155902	8
Caelo	Progesterone, micronized	13155920	1
Caelo	Progesterone, micronized	13155921	2
Caelo	Progesterone, micronized	13155927	2
Phönix	Progesterone, micronized	13155920	1
Caelo	Progesterone, micronized	13155928	3
Caelo	Progesterone, micronized	13155929	3
PHOENIX am 18.03.2014	Progesterone, micronized	13A02-N01	1
Phoenix 28.03.2014	Progesterone, micronized	13G11-N02	1
Fagron	Progesterone, micronized	13H01-N03	7

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
Phoenix 09.12.14	Progesterone, micronized	13H01-N03	1
Caelo	Progesterone, micronized	13G11-N02	1
Fagron	Progesterone, micronized	13K28-B30-288261	2
Fagron	Progesterone, micronized	13K28-B30-288263	1
Euro OTC	Progesterone, micronized	1401002-01	5
Fagron	Progesterone, micronized	13K28-B30-288262	2
Caelo	Progesterone, micronized	140100201	1
Dorfmeister	Progesterone, micronized	140301-01	1
Euro OTC	Progesterone, micronized	1403019-01	2
Euro OTC	Progesterone, micronized	1406022-01	1
Euro OTC	Progesterone, micronized	1406022-02	2
Europh-Jenne	Progesterone, micronized	1406022-01	1
Euro OTC	Progesterone, micronized	1406910-01	1
Euro OTC	Progesterone, micronized	140602202	1
Euro OTC	Progesterone, micronized	1409010-01	1
Euro OTC	Progesterone, micronized	1409019-01	1
Euro OTC	Progesterone, micronized	1409029-01	3
Euro OTC	Progesterone, micronized	140910-01	1
Euro OTC	Progesterone, micronized	1411043-01	2
Caelo	Progesterone, micronized	14253906	3
Caelo	Progesterone, micronized	14253911	3
Caelo	Progesterone, micronized	14253915	2
Fagron	Progesterone, micronized	14C10-B01	1
Fagron	Progesterone, micronized	14D22-B04	1
Fagron	Progesterone, micronized	14D22-B04-293477	2
Fagron	Progesterone, micronized	14D22-B293479	1
Fagron	Progesterone, micronized	14H13-B05-300216	2
Fagron	Progesterone, micronized	14G01-B06	1
Fagron	Progesterone, micronized	14K11-B04300921	1
Fagron	Progesterone, micronized	14k11-b04	1
Caelo	Progesterone, micronized	14H13-B05-3002016	1
Fagron	Progesterone, micronized	14K11-B04-300920	4
Caelo	Progesterone, micronized	14K11-B04-300920	1
Fagron	Progesterone, micronized	14K11-B04-300922	1
Fagron	Progesterone, micronized	14K11-B04-300923	1
Fagron	Progesterone, micronized	14022-B04-293476	1
Euro OTC	Progesterone, micronized	1503012-01	2
Euro OTC	Progesterone, micronized	1502030-01	2
Euro OTC	Progesterone, micronized	1506033-01	4
Euro OTC	Progesterone, micronized	150900801	1
Euro OTC	Progesterone, micronized	1509008-01	4
Caelo	Progesterone, micronized	15124910	1
Euro OTC	Progesterone, micronized	1509008-02	1
Caelo	Progesterone, micronized	15124919	1
Caelo	Progesterone, micronized	15319601	1
Caelo	Progesterone, micronized	15319602	1
Caelo	Progesterone, micronized	15319607	2
Phönix	Progesterone, micronized	15319604	1
Caelo	Progesterone, micronized	15319618	1
Fagron	Progesterone, micronized	15C31-B06-308439	1
Fagron	Progesterone, micronized	15C31-B06	1
Fagron	Progesterone, micronized	15C31-B06-308796	4
Ebert u. Jacobi 16.0...	Progesterone, micronized	15C31-B06-312963	1
Fagron	Progesterone, micronized	15C31-B06-316105	2
Euro OTC	Progesterone, micronized	1601009-01	2
Caelo	Progesterone, micronized	15I11-B05-314184	1
Caelo	Progesterone, micronized	160100902	1
Euro OTC	Progesterone, micronized	1601009-02	2
Caelo	Progesterone, micronized	16103602	3
Caelo	Progesterone, micronized	16A20-B02-319103	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Progesterone, micronized	19051502	1
Euro OTC	Progesterone, micronized	7406022-01	1
Fagron	Progesterone, micronized	5013I-03235	1
Audor Pharma	Progesterone, micronized	APC01-120613P	1
Fagron	Progesterone, micronized	2006500007	1
Audor Pharma	Progesterone, micronized	APC01-150311P	1
Audor Pharma	Progesterone, micronized	APC01-141212P	1
Audor Pharma	Progesterone, micronized	APC01-150708P	3
Audor Pharma	Progesterone, micronized	APC01-151114P	2
Anzag 07.04.2016	Progesterone, micronized	APC01-150708P	1
Audor Pharma	Progesterone, micronized	APC01-160201	1
Audor Pharma	Progesterone, micronized	APC01-160201P	1
Euro/ Sanacorp	Progesterone, micronized	C01-131116(M)	1
Caelo	Progesterone, micronized	9195408	1
Fagron	Progesterone, micronized	HTT140302	1
Euro OTC	Progesterone, micronized	11110523-01	1
Gehe	Progesterone, micronized	1111053-01	4
Euro OTC	Progesterone, micronized	1111053-01	10
Fagron	Progesterone, micronized	1910213235	1
Caelo	Progesterone, micronized	12A19-N04	2
Klenk	Progesterone, micronized	C01-120322	1
Fagron	Progesterone, micronized	12A19-N04	3
A.H. 03.06.13 ek: 6,50EUR	Progesterone, micronized	1304014-01	1
Fagron	Progesterone, micronized	1-111218	1
Caelo	Progesterone, micronized	9195429	1
Euro OTC	Progesterone, micronized		1
FARGON	Progesterone, micronized	10a21-n18	1
Caelo	Progesterone, micronized	11177219	3
Caelo	Progesterone, micronized	11177207	2
Euro OTC	Progesterone, micronized	1206024-01	2
Caelo	Progesterone, micronized	11177221	2
Euro OTC	Progesterone, micronized	1211004-01	6
Alliance Healthcare	Progesterone, micronized	1206024-02	1
Euro OTC	Progesterone, micronized	12111004-01	1
Caelo	Progesterone, micronized	12195905	2
Caelo	Progesterone, micronized	12195902	1
Caelo	Progesterone, micronized	12195906	4
Caelo	Progesterone, micronized	12195907	5
ANZAG	Progesterone, micronized	12195907	2
Caelo	Progesterone, micronized	12195912	3
Caelo	Progesterone, micronized	12195913	3
Caelo	Progesterone, micronized	12195914	2
Caelo	Progesterone, micronized	12195920	10
Sanacorp	Progesterone, micronized	12195914	1
Phoenix	Progesterone, micronized	12195928	3
Sanacorp	Progesterone, micronized	12195928	1
Fagron	Progesterone, micronized	12a19-n04	1
Fagron	Progesterone, micronized	12D05-N06	5
Fagron	Progesterone, micronized	12G05-N17	10
Fagron	Progesterone, micronized	12K05-N07	2
FARGON	Progesterone, micronized	13/11-n11	1
Fagron	Progesterone, micronized	12k05-n07	1
Fagron	Progesterone, micronized	12K05-N01	1
Fagron	Progesterone, micronized	13/11-N11	1
EuRho	Progesterone, micronized	1304040-02	1
Euro OTC	Progesterone, micronized	1304040-01	4
Euro OTC	Progesterone, micronized	130404001	1
Caelo	Progesterone, micronized	1304040-01	1
Apotärze	Progesterone, micronized	1304040-02	1
Euro OTC	Progesterone, micronized	1308015-01	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Progesterone, micronized	130404002	2
Euro OTC	Progesterone, micronized	1304040-2	1
China Medica	Progesterone, micronized	1308015-01	1
Sanacorp	Progesterone, micronized	13155902	1
Fagron	Progesterone, micronized	13A02N01	1
Synopharm am 10.09.2012	Progesterone, micronized	13A02-N01	1
Fagron	Progesterone, micronized	13A02-N01	4
Caelo	Progesterone, micronized	13A02-N01	3
Fagron	Progesterone, micronized	13b08-n01	1
Fagron	Progesterone, micronized	13A02-N02	1
Fagron	Progesterone, micronized	13G11-N02	10
Fagron	Progesterone, micronized	13I11-N11	2
	Progesterone, micronized	1401002-01	2
Fagron	Progesterone, micronized	13K-B30-288261	1
Audor Pharma	Progesterone, micronized	APC01-120708P	3
Euro OTC	Progesterone, micronized	200650	1
Fagron	Progesterone, micronized	14C10-B01-293478	1
Fagron	Progesterone, micronized	14C10B0129347	1
fargon	Progesterone, micronized	8577420	1
Caelo	Progesterone, micronized	27121303	1
Euro OTC	Progesterone, micronized	c01-111218	1
Fagron	Progesterone, micronized	C01-120322	1
Caelo	Progesterone, micronized	C01-120613	1
Fagron	Progesterone, micronized	C01-130301	1
Audor Pharma	Progesterone, micronized	C01-120708P	1
Fagron	Progesterone, micronized	C01-120613	1
Euro OTC	Progesterone, micronized	c01-130301	1
Euro OTC	Progesterone, micronized	C01-130301 (M)	1
Euro OTC	Progesterone, micronized	C01-130301M	1
Sanacorp	Progesterone, micronized	C01-130504	1
Euro OTC	Progesterone, micronized	co1-111218 (M)	1
FARGON	Progesterone, micronized		1
Gehe	Progesterone, micronized	9195429	1
Caelo	Progesterone, micronized	9195419	1
Dorfmeister	Progesterone, micronized	1304040-02	1
Fagron	Progesterone, micronized	12D05N06	1
Sanacorp	Progesterone, micronized	13A02-N01	1
AHD	Progesterone, micronized	13I11-N11	1

- 55 647 spectra from 335 *Apo-Ident* customers from a total of 20 467 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Progesterone, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Progesterone, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	540	0	75 338
Type B	0	886	0	80 462
Type C	0	352	2	55 647

The substance/substance group *Progesterone, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8889 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 99.3228 %)
Type C	100.0000 % (> 99.8622 %)	99.4350 % (> 98.5876 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20024	20024	0.00	21.82
20546	20546	0.00	29.96
20718	21907	4.88	15.19
21868	21868	0.00	15.18
21870	21870	0.00	19.51
21907	21907	0.00	16.05
22226	22226	0.00	20.33
22301	22301	0.00	26.96
22303	22303	0.00	17.74
22525	22525	0.00	27.91
22830	22301	3.08	27.88
22831	21907	2.92	21.33

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Promethazine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20208-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Promethazine hydrochloride; Promethazini hydrochloridum; Promethazinum hydrochloricum

Special notes

When selecting the *Promethazine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Promethazine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Promethazine hyd...	10334401	20208	40	AR-12-FG-002998-01
Caelo	Promethazine hyd...	13119214	21690	40	20130506

Validation samples

A total of 213 227 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 *Promethazine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Promethazine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Promethazine hydrochloride	13119214	21690 [†]	20
Caelo	Promethazine hydrochloride	161466	22628	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Promethazine hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Promethazine hydrochloride	14336505	1
Caelo	Promethazine hydrochloride	13119211	1
Caelo	Promethazine hydrochloride	11352305	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*.

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Promethazine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Promethazine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	3	0	55 998

The substance/substance group *Promethazine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20208	20208	0.00	48.69
21690	20208	11.72	59.90

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Propranolol hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20954-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Propranolol hydrochloride; Propranololi hydrochloridum; Propranololum hydrochloricum

Special notes

When selecting the *Propranolol hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Propranolol hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Propranolol hydr...	13I13-N04	20954	40	1402307
Caelo	Propranolol hydr...	12370712	21396	40	20130116
Caelo	Propranolol hydr...	12370712	21410	40	20130116
Fagron	Propranolol hydr...	15F16-B02-312979	22591	40	20150630

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Propranolol hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 121 spectra of 4 reference samples from the substance/substance group *Propranolol hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Propranolol hydrochloride	10C15-N15	20253	41
Caelo	Propranolol hydrochloride	12370712	21396 [†]	20
Caelo	Propranolol hydrochloride	12370712	21410 [†]	20
Caelo	Propranolol hydrochloride	15283302	22590	40

- 81 227 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 154 spectra from 91 *Apo-Ident* customers from 61 batches from the substance/substance group *Propranolol hydrochloride*.

[†]These spectra were recorded from 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
Fagron	Propranolol hydrochloride	12K06-N07	9
Fagron	Propranolol hydrochloride	11D01-N11	1
Fagron	Propranolol hydrochloride	4071401	1
Caelo	Propranolol hydrochloride	12370710	2
Caelo	Propranolol hydrochloride	12370709	2
Sanacorp	Propranolol hydrochloride	12370712	1
Caelo	Propranolol hydrochloride	13/13-N04	4
Caelo	Propranolol hydrochloride	12370712	1
Caelo	Propranolol hydrochloride	13379807	3
Fagron	Propranolol hydrochloride	1313-N04	2
Caelo	Propranolol hydrochloride	13379806	1
Caelo	Propranolol hydrochloride	13379809	2
Fagron	Propranolol hydrochloride	13I13-N04	7
Fagron	Propranolol hydrochloride	13E15B40-297021	1
Fagron	Propranolol hydrochloride	13E13-B40-289355	1
Caelo	Propranolol hydrochloride	13E15-B40	3
Fagron	Propranolol hydrochloride	13E15-B40-289355	10
Fagron	Propranolol hydrochloride	13E15-B40	2
Caelo	Propranolol hydrochloride	13E15-B40-289355	2
Fagron	Propranolol hydrochloride	13E15-B40-294297	5
Alliance health	Propranolol hydrochloride	13E15-B40-294297	1
Fagron	Propranolol hydrochloride	13I13-N04	1
Caelo	Propranolol hydrochloride	15082401	6
Gehe Kassel 26.06.2015	Propranolol hydrochloride	15082401	1
Gutenberg-Apotheke	Propranolol hydrochloride	13I13-N04	1
Caelo	Propranolol hydrochloride	13I13N04	1
Calo/AHD	Propranolol hydrochloride	15082401	1
Caelo	Propranolol hydrochloride	15082405	3
Caelo	Propranolol hydrochloride	15283301	5
Caelo	Propranolol hydrochloride	15283302	3
Caelo/Noweda	Propranolol hydrochloride	15283302	1
Caelo	Propranolol hydrochloride	15422501	3
Caelo	Propranolol hydrochloride	15422502	4
Caelo	Propranolol hydrochloride	15422505	2
Changzhou Yabang Pharma...	Propranolol hydrochloride	15F16-B02	1
Caelo	Propranolol hydrochloride	15F16-B02	1
Caelo	Propranolol hydrochloride	15F16-B02-312979	1
Fagron	Propranolol hydrochloride	15F16B02312979	1
Fagron	Propranolol hydrochloride	15F16-B02-312979	2
Fagron	Propranolol hydrochloride	15K11-B01	1
Fagron	Propranolol hydrochloride	15K11-B01-316401	3
Caelo	Propranolol hydrochloride	15K11-B01-316401	1
Inresa 22.09.15	Propranolol hydrochloride	3043PRRII	1
phönix	Propranolol hydrochloride	2/AKD3	1
Fagron	Propranolol hydrochloride	28051508	1
Fagron	Propranolol hydrochloride	3050PRII	1
Fagron	Propranolol hydrochloride	3112U-03609	1
Fagron	Propranolol hydrochloride	3913M-03609	1
Caelo	Propranolol hydrochloride	M130104	1
Fagron	Propranolol hydrochloride	M130104	1
Löwen City-Apotheke Bar...	Propranolol hydrochloride	4012013	1
Fagron	Propranolol hydrochloride	11F21-N11	2
Fagron	Propranolol hydrochloride	402310015	1
Fagron	Propranolol hydrochloride	11I19-N09	1
Fagron	Propranolol hydrochloride	9L09-N06	1
ANZAG am 10.05.2012	Propranolol hydrochloride	11L01-N05	1
Caelo	Propranolol hydrochloride	11F21-N11	1
Fagron	Propranolol hydrochloride	11L01-N05	2
Noweda	Propranolol hydrochloride	11L01-N05	1
Caelo	Propranolol hydrochloride	11L01-N05	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Propranolol hydrochloride	12370703	1
Caelo	Propranolol hydrochloride	12a27-n04	1
Fagron	Propranolol hydrochloride	12A27-N04	1
Fagron	Propranolol hydrochloride	12D27-N14	4
Caelo	Propranolol hydrochloride	12D27-N14	2
Fagron	Propranolol hydrochloride	12f29-n06	1
Fagron	Propranolol hydrochloride	12F29-N06	4
Fagron	Propranolol hydrochloride	12F29-N06	1
Fagron	Propranolol hydrochloride	12K06-N07	1
Fagron	Propranolol hydrochloride	12K06N07	1
fragon/AHD	Propranolol hydrochloride	13/13-N04	1
Fagron	Propranolol hydrochloride	13/13-N04	3
Fagron	Propranolol hydrochloride	20250711-8	1
Fagron	Propranolol hydrochloride	31101201	1
Fagron	Propranolol hydrochloride	3050PRRII	1
Noweda	Propranolol hydrochloride		1
Fagron	Propranolol hydrochloride	9CMK6AA71374	1
Gehe	Propranolol hydrochloride		1
InfectoPharm	Propranolol hydrochloride	J051201	1
InfectoPharm	Propranolol hydrochloride	J0512011	1
Caelo	Propranolol hydrochloride	12370707	1

- 55 847 spectra from 335 *Apo-Ident* customers from a total of 20 550 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Propranolol hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propranolol hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	121	0	81 227
Type C	0	131	23	55 847

The substance/substance group *Propranolol hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0413 %)
Type C	100.0000 % (> 99.8622 %)	85.0649 % (> 83.1169 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20954	20954	0.00	50.40
21396	20954	8.19	50.60
21410	20954	6.53	52.50
22591	20954	6.01	46.43

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Propyl-4-hydroxybenzoate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20981-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Propyl-4-hydroxybenzoate; Propylis parahydroxybenzoas; Propylium parahydroxybenzoicum

Special notes

When selecting the *Propyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Propyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Propyl-4-hydroxy...	11373523	20981	40	1402440
Caelo	Propyl-4-hydroxy...	13365009	21758	40	20131203
Caelo	Propyl-4-hydroxy...	162595	22754	40	20161005*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Propyl-4-hydroxybenzoate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 112 spectra of 4 reference samples from the substance/substance group *Propyl-4-hydroxybenzoate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Propyl-4-hydroxybenzoate	10113716	20132	40
Caelo	Propyl-4-hydroxybenzoate	13365009	21758 [†]	20
Caelo	Propyl-4-hydroxybenzoate	162595	22765	40
Caelo	Propyl-4-hydroxybenzoate	14359008	not required	12

- 81 236 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 93 spectra from 66 *Apo-Ident* customers from 45 batches from the substance/substance group *Propyl-4-hydroxybenzoate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
PHOENIX 10.03.2014	Propyl-4-hydroxybenzoate	11373526	1
Gehe 5.3.14	Propyl-4-hydroxybenzoate	13100215	1
Caelo	Propyl-4-hydroxybenzoate	13100215	8
Caelo	Propyl-4-hydroxybenzoate	13100208	1
Caelo	Propyl-4-hydroxybenzoate	13051504	1
Caelo	Propyl-4-hydroxybenzoate	3041408	1
Caesar &Loretz GmbH	Propyl-4-hydroxybenzoate	13100215	1
Caelo	Propyl-4-hydroxybenzoate	13100217	2
Caelo	Propyl-4-hydroxybenzoate	13100218	2
Caelo	Propyl-4-hydroxybenzoate	13365006	4
Caelo	Propyl-4-hydroxybenzoate	13100219	1
Caelo	Propyl-4-hydroxybenzoate	13365009	4
Caelo	Propyl-4-hydroxybenzoate	13365011	4
Caelo	Propyl-4-hydroxybenzoate	13365012	1
Caelo	Propyl-4-hydroxybenzoate	14359005	5
Caelo	Propyl-4-hydroxybenzoate	14359006	1
Caelo	Propyl-4-hydroxybenzoate	14359008	1
Caelo	Propyl-4-hydroxybenzoate	15246502	1
Caelo	Propyl-4-hydroxybenzoate	15246501	1
Caelo	Propyl-4-hydroxybenzoate	1913I-01931	1
Caelo	Propyl-4-hydroxybenzoate	14359019	1
Caelo	Propyl-4-hydroxybenzoate	221014PAS01	1
Caelo	Propyl-4-hydroxybenzoate	4314U-01931	1
GATT-KOLLER/PHOENIX	Propyl-4-hydroxybenzoate	5080/11130214	1
Sanacorp	Propyl-4-hydroxybenzoate	AKD3	1
siehe WE-Prüfprotokoll	Propyl-4-hydroxybenzoate	84/11	1
Caelo	Propyl-4-hydroxybenzoate	3115M-01931	1
Fagron	Propyl-4-hydroxybenzoate	610M-01931	1
Caelo	Propyl-4-hydroxybenzoate	1108211931	1
Caelo	Propyl-4-hydroxybenzoate	11102609	3
Caelo	Propyl-4-hydroxybenzoate	713Q-01931	1
Caelo	Propyl-4-hydroxybenzoate	11102611	2
Caelo	Propyl-4-hydroxybenzoate	11102621	2
Caelo	Propyl-4-hydroxybenzoate	11102610	1
Noweda	Propyl-4-hydroxybenzoate	11373505	2
Caelo	Propyl-4-hydroxybenzoate	11373505	3
Caelo	Propyl-4-hydroxybenzoate	11102624	3
Post-Apotheke	Propyl-4-hydroxybenzoate	11373505	1
Caelo	Propyl-4-hydroxybenzoate	11373504	1
Anzag	Propyl-4-hydroxybenzoate	11373512	2
Caelo	Propyl-4-hydroxybenzoate	11373512	5
Caelo	Propyl-4-hydroxybenzoate	11373518	3
Caelo	Propyl-4-hydroxybenzoate	113735223	1
Herbasinica	Propyl-4-hydroxybenzoate	11373523	1
AHD	Propyl-4-hydroxybenzoate	11373523	1
Caelo	Propyl-4-hydroxybenzoate	11373523	2
Caelo	Propyl-4-hydroxybenzoate	11373524	1
Phönix 14.01.2014	Propyl-4-hydroxybenzoate	11373526	1
Phoenix	Propyl-4-hydroxybenzoate	13100215	1
Caelo	Propyl-4-hydroxybenzoate	290114PML03	1
Fagron	Propyl-4-hydroxybenzoate	12B13-N04	1
Euro OTC	Propyl-4-hydroxybenzoate	2509025	1
Caelo	Propyl-4-hydroxybenzoate	82792159	1
Caesar/Noweda	Propyl-4-hydroxybenzoate	3710M-01931	1

- 55 908 spectra from 335 *Apo-Ident* customers from a total of 20 568 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Propyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propyl-4-hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	102	10	81 236
Type C	0	89	4	55 908

The substance/substance group *Propyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	91.0714 % (> 88.3929 %)
Type C	100.0000 % (> 99.8622 %)	95.6989 % (> 92.4731 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20981	20981	0.00	20.93
21758	20981	5.18	20.22
22754	22754	0.00	21.60

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Propyphenazone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20805-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Propyphenazone; Propyphenazonum; Propyphenazonum plv.

Special notes

When selecting the *Propyphenazone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Propyphenazone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Propyphenazone	12039103	20805	40	1402051
Caelo	Propyphenazone	13332206	21454	40	20131009

Validation samples

A total of 213 227 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 *Propyphenazone*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Propyphenazone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Propyphenazone	9369110	20224	40
Caelo	Propyphenazone	13332206	21454 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 *Apo-Ident* customers from 14 batches from the substance/substance group *Propyphenazone*.

Supplier	Substance	Batch	Spectra
Raben-Apotheke Mildenau	Propyphenazone	12039103	1
Fagron	Propyphenazone	13B12-B02-297171	1
Caelo	Propyphenazone	13036702	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
Fargon	Propyphenazone	11H31-N07	1
Caelo	Propyphenazone	12039101	2
Gatt-Koller / Phoenix	Propyphenazone	419/02123112	1
Caelo	Propyphenazone	12039112	1
Euro OTC	Propyphenazone		1
Caelo	Propyphenazone	13332205	3
Caelo	Propyphenazone	13137104	1
Caelo	Propyphenazone	15122502	1
Caelo	Propyphenazone	15122504	1
Caelo	Propyphenazone	15122505	1
Caelo	Propyphenazone	15348902	1
Caelo	Propyphenazone	12039103	1

- 55 980 spectra from 335 *Apo-Ident* customers from a total of 20 597 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Propyphenazone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Propyphenazone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	19	2	55 980

The substance/substance group *Propyphenazone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	90.4762 % (> 76.1905 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20805	20805	0.00	47.05
21454	20805	5.31	46.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pyridoxal-5-phosphate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20830-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pyridoxal-5-phosphate; Pyridoxali phosphas

Special notes

When selecting the *Pyridoxal-5-phosphate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pyridoxal-5-phosphate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Pyridoxal-5-phos...	1302029-01	20830	40	8897
Euro OTC	Pyridoxal-5-phos...	1302029-01	21097	40	20130315

Validation samples

A total of 213 227 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 *Pyridoxal-5-phosphate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *Pyridoxal-5-phosphate*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Pyridoxal-5-phosphate*.

Supplier	Substance	Batch	Spectra
Inresa Arznei	Pyridoxal-5-phosphate	13100411	1
Euro OTC	Pyridoxal-5-phosphate	1408002-01	1
Denk	Pyridoxal-5-phosphate	C041402802	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pyridoxal-5-phosphate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pyridoxal-5-phosphate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	0	0	81 348
Type C	0	3	0	55 998

The substance/substance group *Pyridoxal-5-phosphate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20830	20830	0.00	47.44
21097	20830	4.54	46.02

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Pyridoxine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20440-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Pyridoxine hydrochloride; Pyridoxini hydrochloridum; Pyridoxini hydrochloridum

Special notes

When selecting the *Pyridoxine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Pyridoxine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Pyridoxine hydro...	09I16-N14	20440	40	AR-12-FG-008409-01
Caelo	Pyridoxine hydro...	14262302	21675	40	20141002
Euro OTC	Pyridoxine hydro...	1401044-01	21678	40	20140221
Euro OTC	Pyridoxine hydro...	1407009-01	21773	40	20140807
Euro OTC	Pyridoxine hydro...	1507012	21846	40	0000010614
Euro OTC	Pyridoxine hydro...	1601039	22300	40	20160203*

Validation samples

A total of 213 227 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 *Pyridoxine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 260 spectra of 9 reference samples from the substance/substance group *Pyridoxine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Pyridoxine hydrochloride	L12010105	20390	40
Caelo	Pyridoxine hydrochloride	14262302	21675 [†]	20
Euro OTC	Pyridoxine hydrochloride	1401044-01	21678 [†]	20
Euro OTC	Pyridoxine hydrochloride	1407009-01	21773 [†]	20
Euro OTC	Pyridoxine hydrochloride	1507012	21846 [†]	20
Euro OTC	Pyridoxine hydrochloride	1601039	22300 [†]	20
Euro OTC	Pyridoxine hydrochloride	1604063	22569	40
Caelo	Pyridoxine hydrochloride	162225	22770	40
Euro OTC	Pyridoxine hydrochloride	1608035	22798	40

- 81 088 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 42 spectra from 10 *Apo-Ident* customers from 21 batches from the substance/substance group *Pyridoxine hydrochloride*.

Supplier	Substance	Batch	Spectra
Euro OTC	Pyridoxine hydrochloride	1110001-01	1
Caelo	Pyridoxine hydrochloride	13102509	2
Caelo	Pyridoxine hydrochloride	13102516	1
Euro OTC	Pyridoxine hydrochloride	1407009-01	1
Caelo	Pyridoxine hydrochloride	14262302	3
Euro OTC	Pyridoxine hydrochloride	1507012-01	1
Caelo	Pyridoxine hydrochloride	15218707	1
Fagron	Pyridoxine hydrochloride	9T16-N14	1
Post-Apotheke	Pyridoxine hydrochloride	10026903	1
Caelo	Pyridoxine hydrochloride	11021406	1
Caesar & Loretz GmbH D-...	Pyridoxine hydrochloride	11197009	5
Euro OTC	Pyridoxine hydrochloride	1206022-02	1
Fagron	Pyridoxine hydrochloride	11L19-N06	1
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214102	5
Caelo	Pyridoxine hydrochloride	12214104	1
Caelo	Pyridoxine hydrochloride	12214110	2
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214115	7
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214110	2
Caesar & Loretz GmbH, 4...	Pyridoxine hydrochloride	12214119	2
Euro OTC	Pyridoxine hydrochloride	13D02-N04	1
Fagron	Pyridoxine hydrochloride	L13080030	1
Fagron	Pyridoxine hydrochloride	12e02-n02	1

- 55 959 spectra from 335 *Apo-Ident* customers from a total of 20 590 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Pyridoxine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Pyridoxine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	260	0	81 088
Type C	0	42	0	55 959

The substance/substance group *Pyridoxine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.6923 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 85.7143 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20440	20440	0.00	66.92
21675	21846	6.36	72.22
21678	21846	4.19	71.76
21773	21846	1.06	71.61
21846	21846	0.00	71.37
22300	22300	0.00	71.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Quinidine sulfate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20819-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Quinidine sulfate dihydrate; Chinidini sulfas; Quinidine sulphate dihydrate

Special notes

When selecting the *Quinidine sulfate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Quinidine sulfate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinidine sulfat...	12L04-N10	20819	40	AR-14-FG-013249-01
Fagron	Quinidine sulfat...	12J16-B03	21217	39	1412323
Fagron	Quinidine sulfat...	14I04-B09-304357	21810	35	AR-15-FG-015409-01

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 114 spectra of 3 reference samples from the substance/substance group *Quinidine sulfate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75764 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Quinidine sulfate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Quinidine sulfate dihydrate	11J11-N02	20375	40
Fagron	Quinidine sulfate dihydrate	12E25-N03	20582	40
Fagron	Quinidine sulfate dihydrate	12E25-N03	20604	40
Fagron	Quinidine sulfate dihydrate	14I04-B09-304357	21810 [†]	15
Fagron	Quinidine sulfate dihydrate	16A06-B04-324954	22970	40

- 81173 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Quinidine sulfate dihydrate*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Quinidine sulfate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinidine sulfate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	114	0	75 764
Type B	0	135	40	81 173
Type C	0	0	0	56 001

The substance/substance group *Quinidine sulfate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.7368 %)
Type B	100.0000 % (> 99.9853 %)	77.1429 % (> 75.4286 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20819	20819	0.00	28.57
21217	21217	0.00	27.95
21810	21810	0.00	28.62

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Quinine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20547-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Quinine hydrochloride; Chinini hydrochloridum; Chininum hydrochloricum

Special notes

When selecting the *Quinine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Quinine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinine hydrochl...	12C29-N04	20547	40	AR-14-FG-000696-01
Fagron	Quinine hydrochl...	13G10-N07	21235	30	20130809
Fagron	Quinine hydrochl...	13I30-B02-295630	21809	40	AR-15-FG-015410-01
Caelo	Quinine hydrochl...	15376201	22309	40	20151105

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Quinine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 728 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Quinine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Quinine hydrochloride	13I30-B02-295630	21809 [†]	20
Caelo	Quinine hydrochloride	15376201	22309 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 6 spectra from 6 *Apo-Ident* customers from 6 batches from the substance/substance group *Quinine hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Quinine hydrochloride	13D24-N06	1
Caelo	Quinine hydrochloride	12316611	1
Fagron	Quinine hydrochloride	10N129B	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
Fagron	Quinine hydrochloride	13G10-N07	1
Gatt-Koller	Quinine hydrochloride	3500/08103810	1
Caelo	Quinine hydrochloride	12316605	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Quinine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	75 728
Type B	0	40	0	81 308
Type C	0	6	0	55 995

The substance/substance group *Quinine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20547	20547	0.00	29.10
21235	21809	8.27	29.58
21809	21809	0.00	21.59
22309	21809	4.71	24.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Quinine sulfate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21057-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Quinine sulfate dihydrate; Chinini sulfas; Chininum sulfuricum; Quinine sulphate dihydrate

Special notes

When selecting the *Quinine sulfate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Quinine sulfate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Quinine sulfate ...	13J23-N03	21057	40	1404401
Fagron	Quinine sulfate ...	14B27-B01	21277	40	AR-16-FG-009455-01
Caelo	Quinine sulfate ...	13024604	21429	40	AR-16-FG-005472-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Quinine sulfate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Quinine sulfate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Quinine sulfate dihydrate	13024604	21429 [†]	20
Caelo	Quinine sulfate dihydrate	15230005	22959	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Quinine sulfate dihydrate*.

Supplier	Substance	Batch	Spectra
Gatt-Koller / Phoenix	Quinine sulfate dihydrate	2503/07143314	1
Caelo	Quinine sulfate dihydrate	15B06B03304359	1
Gatt-Koller / Phoenix	Quinine sulfate dihydrate	4928/11132214	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*.

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Quinine sulfate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinine sulfate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	60	0	81 288
Type C	0	3	0	55 998

The substance/substance group *Quinine sulfate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21057	21057	0.00	20.95
21277	21277	0.00	15.08
21429	21429	0.00	19.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Quinoline sulfates
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20450-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Quinoline sulfates; 8-quinolinol sulfate monohydrate; 8-quinolinol sulphate monohydrate; Chinolini et kalii sulfas; Hydroxychinoliniumsulfuricum; Kalii oxychinolinum sulfuricum; Quinolinol sulfate potassium sulfate; Quinolinol sulphate potassium sulphate

Special notes

When selecting the *Quinoline sulfates* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Quinoline sulfates*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	8-quinolinol sul. ...	10F01-N15	20450	40	AR-12-FG-009377-01
mibe GmbH	Quinolinol sulfa. ...	100804	20573	40	20100923
Fagron	8-quinolinol sul. ...	12H21-N08	20748	40	20120831
Caelo	Quinolinol sulfa. ...	13071104	20983	40	1403095

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Quinolinol sulfa...	13403501	21430	40	20131218
Caelo	Quinolinol sulfa...	15147704	22606	40	20150618
Caelo	Quinolinol sulfa...	162218	22626	40	20160808*

Validation samples

A total of 213 227 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 *Quinoline sulfates*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1569 batches from further 382 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Quinoline sulfates*.

Supplier	Substance	Batch	Sample ID	Spectra
Dermapharm	Quinolinol sulfate potassium...	71101	20168	40
Caelo	Quinolinol sulfate potassium...	13403501	21430 [†]	20
Caelo	Quinolinol sulfate potassium...	15147704	22607	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 115 spectra from 58 *Apo-Ident* customers from 26 batches from the substance/substance group *Quinoline sulfates*.

Supplier	Substance	Batch	Spectra
Dermapharm	8-quinolinol sulfate monohyd...	120905	2
Dermapharm	8-quinolinol sulfate monohyd...	100804	1
Fagron	8-quinolinol sulfate monohyd...	13G10-N06	1
Fagron	8-quinolinol sulfate monohyd...	11I09-N09	1
siehe WE-Prüfprotokoll	8-quinolinol sulfate monohyd...	96/09	1
Fagron	8-quinolinol sulfate monohyd...	11/09-N09	1
Fagron	8-quinolinol sulfate monohyd...	11L08-N08	1
Fagron	8-quinolinol sulfate monohyd...	11L19-N14	1
Fagron	8-quinolinol sulfate monohyd...	11L08-N07	2
Fagron	8-quinolinol sulfate monohyd...	13A04-N05	2
Fagron	Quinolinol sulfate potassium...	10F01-N15	2
Dermapharm	Quinolinol sulfate potassium...	100804	6
Caelo	Quinolinol sulfate potassium...	13071104	4
Phönix Gotha	Quinolinol sulfate potassium...	120905	4
Caelo	Quinolinol sulfate potassium...	13071106	1
Caelo	Quinolinol sulfate potassium...	13403501	4
Caelo	Quinolinol sulfate potassium...	13403506	5
Dermapharm	Quinolinol sulfate potassium...	140804	20
Dermapharm	Quinolinol sulfate potassium...	120905	33
Fagron	Quinolinol sulfate potassium...	140804	1
Dermapharm	Quinolinol sulfate potassium...	140804	1
Caelo	Quinolinol sulfate potassium...	13403513	1
Caelo	Quinolinol sulfate potassium...	13071101	2
Fagron	Quinolinol sulfate potassium...	13G10-N06	1
Caelo	Quinolinol sulfate potassium...	2210E-03423	1
Nachprüfung	Quinolinol sulfate potassium...	2812U03423	1
Dermopharm AG/Noweda	Quinolinol sulfate potassium...	140804	1
Phönix Gotha	Quinolinol sulfate potassium...	140804	1
Stumpf	Quinolinol sulfate potassium...	100804	1
Dermapharm	Quinolinol sulfate potassium...	1470804	1
Fiebig ek: 5,68EUR	Quinolinol sulfate potassium...	100804	2
Phönix Gotha	Quinolinol sulfate potassium...	100804	2
Caelo	Quinolinol sulfate potassium...	120905	1
Gehe	Quinolinol sulfate potassium...	120905	1
Caelo	Quinolinol sulfate potassium...	82716049	1
Caelo	Quinolinol sulfate potassium...	7051305	1
Gehe	Quinolinol sulfate potassium...	10281609	1
Caelo	Quinolinol sulfate potassium...	10281601	1
Caelo	Quinolinol sulfate potassium...	9106304	1

- 55 886 spectra from 335 *Apo-Ident* customers from a total of 20 585 batches from a further 682 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Quinoline sulfates* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinoline sulfates* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 598
Type B	0	68	32	81 248
Type C	0	89	26	55 886

The substance/substance group *Quinoline sulfates* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	68.0000 % (> 65.0000 %)
Type C	100.0000 % (> 99.8622 %)	77.3913 % (> 74.7826 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20450	20450	0.00	56.28
20573	20983	3.17	58.25
20748	20450	8.66	59.81
20983	20983	0.00	60.25
21430	22626	18.06	68.41
22606	22626	2.78	70.51
22626	22626	0.00	71.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Quinoline yellow**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20456-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Quinoline yellow

Special notes

When selecting the *Quinoline yellow* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Quinoline yellow*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Quinoline yellow	11089608	20456	40	AR-13-FG-002959-01
Fagron	Quinoline yellow	12E24-N01	20731	40	20120601
Caelo	Quinoline yellow	12042010	20922	40	20120314
Caelo	Quinoline yellow	13109108	21305	40	20130415

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Quinoline yellow*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Quinoline yellow*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Quinoline yellow	11089608	20525	40
zu erfassen	Quinoline yellow	pending	20574	40
Fagron	Quinoline yellow	12E24-N01	20731 [†]	20

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 43 spectra from 30 *Apo-Ident* customers from 28 batches from the substance/substance group *Quinoline yellow*.

Supplier	Substance	Batch	Spectra
Caelo	Quinoline yellow	13109109	1
Fagron	Quinoline yellow	13C25-N15	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
Caelo	Quinoline yellow	11089610	2
Caelo	Quinoline yellow	14049401	2
Caelo	Quinoline yellow	14274305	1
Caelo	Quinoline yellow	13109102	2
Caelo	Quinoline yellow	14363202	3
Caelo	Quinoline yellow	14363201	1
Caelo	Quinoline yellow	14274309	1
Fagron	Quinoline yellow	100427	1
Caelo	Quinoline yellow	713E-03146	1
Caelo	Quinoline yellow	11089606	1
Caelo	Quinoline yellow	15276803	1
Caelo	Quinoline yellow	11089601	1
anzag am 06.07.2012	Quinoline yellow	11089608	1
Fagron	Quinoline yellow	11F30-N04	1
Caelo	Quinoline yellow	11089608	1
Noweda	Quinoline yellow	11D13-N01	1
Fagron	Quinoline yellow	11K08-N01	2
Caelo	Quinoline yellow	12042002	3
Caelo	Quinoline yellow	12042004	2
Caelo	Quinoline yellow	12042007	4
PHOENIX	Quinoline yellow	12042004	1
Caelo	Quinoline yellow	12042010	1
Fagron	Quinoline yellow	12L11-N07	1
Fagron	Quinoline yellow	12E24-N05	1
Fagron	Quinoline yellow	12B08-N08	1
Caelo	Quinoline yellow	18011305	1
Caelo	Quinoline yellow	20301211-6	1
Fagron	Quinoline yellow	9878	1

- 55 958 spectra from 335 *Apo-Ident* customers from a total of 20 583 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Quinoline yellow* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Quinoline yellow* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	0	100	81 248
Type C	0	29	14	55 958

The substance/substance group *Quinoline yellow* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	0.0000 % (≥ 0.0000 %)
Type C	100.0000 % (> 99.8622 %)	67.4419 % (> 60.4651 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20456	20456	0.00	95.34
20731	20456	16.10	80.53
20922	20456	11.98	98.23
21305	20456	16.81	95.34

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Resocrinol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20938-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Resocrinol; Resorcinolum

Special notes

When selecting the *Resocrinol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Resocrinol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Resocrinol	12G24-N04	20938	40	1401462
Caelo	Resocrinol	13293108	21471	40	AR-15-FG-006906-01
Fagron	Resocrinol	13I18-B09-291533	21706	30	20130606

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Resocrinol*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Resocrinol*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Resocrinol	11A19-N09	20240	40
Caelo	Resocrinol	13293108	21471 [†]	20
Fagron	Resocrinol	13I18-B09-291533	21706 [†]	15
Caelo	Resocrinol	161533	22632	40

- 81 233 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 94 spectra from 62 *Apo-Ident* customers from 47 batches from the substance/substance group *Resocrinol*.

Supplier	Substance	Batch	Spectra
Caelo	Resocrinol	10218809	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
Caelo	Resocrinol	11d29-n14	2
Fargon	Resocrinol	11D29-2011	1
Fargon	Resocrinol	11/13-no2	1
Gehe	Resocrinol	11L13-N02	1
Caelo	Resocrinol	2041512	1
Caelo	Resocrinol	10111210	1
Fargon	Resocrinol	11/13-N02	2
Phönix Gotha	Resocrinol	10218802	1
Euro OTC	Resocrinol	11/13-N02	1
Caelo	Resocrinol	11309602	1
Caelo	Resocrinol	11309610	4
Fargon	Resocrinol	11A19-N09	1
Fargon	Resocrinol	11L19-N19	4
Fargon	Resocrinol	12/16010	1
Caelo	Resocrinol	12255614	2
Anzag 08.02.2013	Resocrinol	12G24-N04	1
Fargon	Resocrinol	12G24-N04	9
Fargon	Resocrinol	12G24-N004	1
Gehe	Resocrinol	12G-24-N04	1
Caelo	Resocrinol	12G24-N04	2
Gehe	Resocrinol	12G24-N04	1
vdl	Resocrinol	12G24-N04	1
Gehe 16.06.2013	Resocrinol	12G24-N04	1
Euro OTC	Resocrinol	12g24-n04	1
Fargon	Resocrinol	12K30-N03	4
Fargon	Resocrinol	12g24-N04	1
Fargon	Resocrinol	13/17071	1
anzag 13.09.13	Resocrinol	12K30N30	1
Caelo	Resocrinol	13/18-B09291534	1
Fargon	Resocrinol	13/18-B09-291534	1
Caelo	Resocrinol	13/18-B19-291534	1
Noweda	Resocrinol	1318b09291533	1
Caelo	Resocrinol	13293103	1
Caelo	Resocrinol	13293110	1
Caelo	Resocrinol	13293115	1
Fargon	Resocrinol	13E24-N10	10
Gehe	Resocrinol	13E24-N10	1
Fargon	Resocrinol	13I18-B09	2
Noweda	Resocrinol	13E24-N10	1
Fargon	Resocrinol	14/16062	1
Fargon	Resocrinol	13I18-B09-291533	1
Fargon	Resocrinol	14G10B06	1
Phoenix goettin	Resocrinol	13I18-B09-291534	1
Fargon	Resocrinol	14G10-B06-296296	3
Fargon	Resocrinol	14G10-B06-296297	2
Phönix Gotha	Resocrinol	14G10-B06-296296	1
Fargon	Resocrinol	14G10-B06	1
Caelo	Resocrinol	15009507	3
Fargon	Resocrinol	14J15-B02-307749	1
Caelo	Resocrinol	15009511	1
Fargon	Resocrinol	15K24-B02-317584	1
Caelo	Resocrinol	19061305	1
Caelo	Resocrinol	206370-0003	1
Fargon	Resocrinol	2112I-02170	1
Caelo	Resocrinol	5052	1
GEHE	Resocrinol	11L19-N19	1

- 55 907 spectra from 335 *Apo-Ident* customers from a total of 20 566 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Resocrinol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Resocrinol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	115	0	81 233
Type C	0	93	1	55 907

The substance/substance group *Resocrinol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.7826 %)
Type C	100.0000 % (> 99.8622 %)	98.9362 % (> 95.7447 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20938	20938	0.00	38.03
21471	21471	0.00	33.20
21706	21471	5.00	26.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ribavirin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22346-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ribavirin; Ribavirinum

Special notes

When selecting the *Ribavirin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ribavirin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Ribavirin	1304027-01	22346	30	AR-16-FG-007485-01
Euro OTC	Ribavirin	1308001	22382	30	20130902*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 60 spectra of 2 reference samples from the substance/substance group *Ribavirin*. These samples are listed above in the [calibration samples](#) section.
- 75 818 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 70 spectra of 3 reference samples from the substance/substance group *Ribavirin*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Ribavirin	1304027-01	22346 [†]	15
Euro OTC	Ribavirin	1308001	22382 [†]	15
Euro OTC	Ribavirin	1604012	22528	40

- 81 278 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Ribavirin*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ribavirin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ribavirin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	60	0	75 818
Type B	0	70	0	81 278
Type C	0	0	0	56 001

The substance/substance group *Ribavirin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9889 %)	100.0000 % (> 90.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 91.4286 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22346	22346	0.00	28.92
22382	22382	0.00	32.19

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Riboflavin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20409-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Riboflavin; Riboflavinum

Special notes

When selecting the *Riboflavin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Riboflavin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Riboflavin	10F23-N06	20409	40	AR-12-FG-007203-01
Fagron	Riboflavin	13D02-N03	20825	40	AR-15-FG-000733-01
AppliChem	Riboflavin	3E003567	20893	40	20130128
Fagron	Riboflavin	13D02-N03	20914	40	20130405
Caelo	Riboflavin	12003317	20925	40	1405155
Caelo	Riboflavin	13305203	21389	40	AR-15-FG-005686-01

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Riboflavin	15G20-B13-310997	21955	40	20150819
Caelo	Riboflavin	14322008	22492	40	AR-16-FG-013669-01
Fagron	Riboflavin	16B18-B06-319026	22655	40	AR-16-FG-014466-01
Euro OTC	Riboflavin	1701050	23004	40	20170214*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 400 spectra of 10 reference samples from the substance/substance group *Riboflavin*. These samples are listed above in the [calibration samples](#) section.
- 75 478 spectra from a total of 1567 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 6 reference samples from the substance/substance group *Riboflavin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Riboflavin	11L29-N01	20581	40
Fagron	Riboflavin	11L29-N01	20587	40
Fagron	Riboflavin	pending	20609	40
Fagron	Riboflavin	10F23-N06	20641	30
Caelo	Riboflavin	13305203	21389 [†]	20
Fagron	Riboflavin	15G20-B13-310997	21955 [†]	20

- 81 158 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B*

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 *Apo-Ident* customers from 14 batches from the substance/substance group *Riboflavin*.

Supplier	Substance	Batch	Spectra
Fagron	Riboflavin	6120	1
Fagron	Riboflavin	11L29-N01	1
Fagron	Riboflavin	12H30-N02	1
Fagron	Riboflavin	12J17-N07	2
Fagron	Riboflavin	13J29-B04-287534	1
Fagron	Riboflavin	14B03-B07-292071	2
Fagron	Riboflavin	14E01-B10-296718	1
Fagron	Riboflavin	14K03-B04-304718	1
Fagron	Riboflavin	167720-0005	2
Fagron	Riboflavin	15G20-B13-310997	1
Fagron	Riboflavin	15I09-B02-315216	1
Euro OTC	Riboflavin	L1305039-01	2
Euro OTC	Riboflavin	L1210048-01	1
Fagron	Riboflavin	11K02-N01	1

- 55 983 spectra from 335 *Apo-Ident* customers from a total of 20 598 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Riboflavin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Riboflavin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	400	0	75 478
Type B	0	68	122	81 158
Type C	0	15	3	55 983

The substance/substance group *Riboflavin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5000 %)
Type B	100.0000 % (> 99.9853 %)	35.7895 % (> 34.2105 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20409	20409	0.00	45.29
20825	20825	0.00	17.43
20893	22492	9.50	19.90
20914	20825	4.70	18.53
20925	20925	0.00	19.86
21389	21389	0.00	16.81
21955	21389	6.52	17.49
22492	22492	0.00	25.64
22655	22655	0.00	20.42
23004	23004	0.00	14.61

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Riboflavin phosphate sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20948-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Riboflavin phosphate sodium; Natrii lactoflavini phosphoricum; Riboflavini natrii phosphas

Special notes

When selecting the *Riboflavin phosphate sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Riboflavin phosphate sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Riboflavin phosp...	13I26-N06	20948	40	1403705
Fagron	Riboflavin phosp...	14J31-B07-300519	21707	30	20141114
Fagron	Riboflavin phosp...	15J02-B03-313137	22269	40	AR-16-FG-009883-02

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Riboflavin phosphate sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 35 spectra of 2 reference samples from the substance/substance group *Riboflavin phosphate sodium*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Riboflavin phosphate sodium	14J31-B07-300519	21707 [†]	15
Fagron	Riboflavin phosphate sodium	15J02-B03-313137	22269 [†]	20

- 81 313 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 1 *Apo-Ident* customers from 4 batches from the substance/substance group *Riboflavin phosphate sodium*.

Supplier	Substance	Batch	Spectra
Fagron	Riboflavin phosphate sodium	13126-N06	1
Fagron	Riboflavin phosphate sodium	12k07-N12	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
Fagron	Riboflavin phosphate sodium	11G15-N06	2
Fagron	Riboflavin phosphate sodium	11K24-N01	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Riboflavin phosphate sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Riboflavin phosphate sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	35	0	81 313
Type C	0	5	0	55 996

The substance/substance group *Riboflavin phosphate sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 82.8571 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20948	20948	0.00	17.34
21707	22269	4.66	16.00
22269	22269	0.00	13.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Rutoside trihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20480-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Rutoside trihydrate; Rutinum; Rutosidum trihydricum

Special notes

When selecting the *Rutoside trihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Rutoside trihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Rutoside trihydr...	11I20-N02	20480	40	AR-13-FG-000836-01
Fagron	Rutoside trihydr...	13K12-B06-295483	21743	40	20131204

Validation samples

A total of 213 227 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 *Rutoside trihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Rutoside trihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Rutoside trihydrate	13K12-B06-295483	21743 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Rutoside trihydrate*.

Supplier	Substance	Batch	Spectra
Fagron	Rutoside trihydrate	L14050127	1
Fagron	Rutoside trihydrate	13K12-B06	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*.

- 55 999 spectra from 335 *Apo-Ident* customers from a total of 20 609 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Rutoside trihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Rutoside trihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	2	0	55 999

The substance/substance group *Rutoside trihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8629 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20480	20480	0.00	56.14
21743	20480	3.94	58.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Saccharin sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20200-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Saccharin sodium; Saccharinum natricum; Saccharinum solubile; Sodium saccharin

Special notes

When selecting the *Saccharin sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Saccharin sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Saccharin sodium	10170511	20200	40	AR-12-FG-002994-01
Fagron	Saccharin sodium	12E03-N01	20482	40	AR-13-FG-000832-01

Validation samples

A total of 213 227 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 *Saccharin sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Saccharin sodium*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Saccharin sodium	15087704	22769	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 59 spectra from 49 *Apo-Ident* customers from 35 batches from the substance/substance group *Saccharin sodium*.

Supplier	Substance	Batch	Spectra
Caelo	Saccharin sodium	13205411	1
Caelo	Saccharin sodium	13205414	2
Caesar & Loretz GmbH Hi...	Saccharin sodium	13205418	2
Caelo	Saccharin sodium	1402970	1
Caelo	Saccharin sodium	14029705	5
Caelo	Saccharin sodium	14029707	2
Caelo	Saccharin sodium	14029710	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Saccharin sodium	14213402	2
Caelo	Saccharin sodium	14213405	3
Caelo	Saccharin sodium	15087703	4
Caelo	Saccharin sodium	15084101	1
Caelo	Saccharin sodium	15087704	3
Euro OTC	Saccharin sodium	15087704	1
Caelo	Saccharin sodium	21092015A	1
Caelo	Saccharin sodium	3131-02206	1
Caelo	Saccharin sodium	15087713	2
Jenne	Saccharin sodium	15087707	1
Caelo	Saccharin sodium	11025605	1
Caelo	Saccharin sodium	10170504	1
Caelo	Saccharin sodium	11025610	1
Caelo	Saccharin sodium	11172805	3
Caelo	Saccharin sodium	11172814	1
Fagron	Saccharin sodium		1
Caelo	Saccharin sodium	1236207	1
Caelo	Saccharin sodium	12139803	1
Caelo	Saccharin sodium	12362607	3
Fargon	Saccharin sodium	12A13-N03	1
Fagron	Saccharin sodium	12K26-N09	1
Fagron	Saccharin sodium	12F19-N039/16	1
Fagron	Saccharin sodium	12E03-N01	1
Caelo	Saccharin sodium	12C08-N08	1
Fagron	Saccharin sodium	13D19-N01	3
Phönix Gotha	Saccharin sodium	11I12-N04	1
Caesar&loretz,Phoenix	Saccharin sodium	15084101	1
Caelo	Saccharin sodium	82885059	1
Fagron	Saccharin sodium	SH203/11	1
Caelo	Saccharin sodium	13205408	1

- 55 942 spectra from 335 *Apo-Ident* customers from a total of 20 576 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Saccharin sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Saccharin sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	55	4	55 942

The substance/substance group *Saccharin sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	93.2203 % (> 88.1356 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20200	20200	0.00	98.30
20482	20482	0.00	88.30

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Salbutamol sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20476-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Salbutamol sulfate; Salbutamol sulphate; Salbutamoli sulfas; Salbutamolum sulfuricum

Special notes

When selecting the *Salbutamol sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Salbutamol sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Salbutamol sulfate	11L21-N10	20476	40	AR-13-FG-001850-01
Fagron	Salbutamol sulfate	13K12-N02	21691	40	20131114

Validation samples

A total of 213 227 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 *Salbutamol sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Salbutamol sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Salbutamol sulfate	13K12-N02	21691 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Salbutamol sulfate*.

Supplier	Substance	Batch	Spectra
Noweda	Salbutamol sulfate	13K12-N02	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Salbutamol sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Salbutamol sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	1	0	56 000

The substance/substance group *Salbutamol sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20476	20476	0.00	46.82
21691	20476	19.35	43.54

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Salicylic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20015-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Salicylic acid; Acidum salicylicum

Special notes

When selecting the *Salicylic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Salicylic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Salicylic acid	82732219	20015	30	I 2009 000 300
Euro OTC	Salicylic acid	1110020-01	20696	40	20120125
Caelo	Salicylic acid	13344018	21760	40	20131020
Euro OTC	Salicylic acid	1509007	21906	40	20150929*
Caelo	Salicylic acid	160109	22443	40	20160229*

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Salicylic acid*. These samples are listed above in the [calibration samples](#) section.
- 75688 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 220 spectra of 6 reference samples from the substance/substance group *Salicylic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Salicylic acid	13344002	21436	60
Caelo	Salicylic acid	13344018	21760 [†]	20
Euro OTC	Salicylic acid	1509007	21906 [†]	20
Caelo	Salicylic acid	160109	22443 [†]	20
Caelo	Salicylic acid	160500	22448	60
Euro OTC	Salicylic acid	1605023	22685	40

- 81128 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 865 spectra from 241 *Apo-Ident* customers from 222 batches from the substance/substance group *Salicylic acid*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Salicylic acid	1106014-01	1
Caelo	Salicylic acid	11197103	2
Caelo	Salicylic acid	12134720	8
Gutenberg-Apotheke	Salicylic acid	12374208	1
Caelo	Salicylic acid	12374211	14
Caelo	Salicylic acid	12374212	2
Caelo	Salicylic acid	13344002	12
Caelo	Salicylic acid	13344013	7
Caelo	Salicylic acid	13344018	13
Caelo	Salicylic acid	13344020	8
Euro OTC	Salicylic acid	1406027-02	5
Caelo	Salicylic acid	14076204	8
Caelo	Salicylic acid	14076202	3
Caelo	Salicylic acid	14076207	9
Caelo	Salicylic acid	14300802	6
Caelo	Salicylic acid	14300809	8
Caelo	Salicylic acid	14336911	10
Caelo	Salicylic acid	14336907	7
Caelo	Salicylic acid	14336920	6
Caelo	Salicylic acid	15084403	4
Caelo	Salicylic acid	15211808	4
Caelo	Salicylic acid	15211809	8
Caelo	Salicylic acid	15217302	9
Caelo	Salicylic acid	16010907	1
Caelo	Salicylic acid	15217301	6
Caelo	Salicylic acid	16010913	1
Caelo	Salicylic acid	9220716	1
Caelo	Salicylic acid	12036216	5
Caelo	Salicylic acid	11311923	3
Caelo	Salicylic acid	11197117	2
Caelo	Salicylic acid	12036211	4
Anzag	Salicylic acid	12036208	1
Caelo	Salicylic acid	11311918	1
Caelo	Salicylic acid	12036225	4
Caelo	Salicylic acid	12134709	32
Caelo	Salicylic acid	12134710	3
Caelo	Salicylic acid	12134714	14
Caelo	Salicylic acid	12134717	11
Sanacorp	Salicylic acid	123036223	1
Sanacorp	Salicylic acid	12374205	1
Fagron	Salicylic acid	13H01-N04	14
Caelo	Salicylic acid	12374207-3454311172	1
Fagron	Salicylic acid	13H01-N08	2
Euro OTC	Salicylic acid	1303020-01	14
Holdermann	Salicylic acid	14E26-B04294624	1
Caelo	Salicylic acid	3601413011-12374211	1
Caelo	Salicylic acid	12374207	8
Caelo	Salicylic acid	7071403	1
Euro OTC	Salicylic acid	102455	1
Caelo	Salicylic acid	10355907	1
Alliance 19.12.12	Salicylic acid	11311906	1
Caelo	Salicylic acid	12036226	10
Caelo	Salicylic acid	12134707	8
Caesar & Loretz GmbH Hi...	Salicylic acid	12134714	1
Caelo	Salicylic acid	12134711	7
Caelo	Salicylic acid	12134715	6
Caelo	Salicylic acid	12134719	2
Caelo	Salicylic acid	12134721	1
Klenk	Salicylic acid	12134722	1
Caelo	Salicylic acid	12134722	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	12323403	3
Caelo	Salicylic acid	12374208	2
Caesar&Loretz GmbH/Anzag	Salicylic acid	12374210	2
Phönix	Salicylic acid	12374210	1
Phönix	Salicylic acid	12374211	1
Caelo	Salicylic acid	12374213	8
Sanacorp	Salicylic acid	1303020-01	1
Caelo	Salicylic acid	1303020-01	2
EuRho	Salicylic acid	1303020-01	4
Anzag/Henry Lamotte	Salicylic acid	1334018	1
AHD	Salicylic acid	13344002	1
Gehe	Salicylic acid	13344002	1
Caelo	Salicylic acid	13344003	8
Caesar & Loretz GmbH	Salicylic acid	13344003	1
Caelo	Salicylic acid	13344014	5
Sanacorp	Salicylic acid	13344014	1
Caesar & Loretz GmbH Hi...	Salicylic acid	13344018	1
Caelo	Salicylic acid	1334403	1
AHD 22.07.14	Salicylic acid	134002	1
Caelo	Salicylic acid	133454002	1
Fagron	Salicylic acid	13B14-N01	16
Fagron	Salicylic acid	13H01-N01	6
Fagron	Salicylic acid	13H01N04	4
Großhandel	Salicylic acid	13H01-N04	1
Gehe	Salicylic acid	13H01-N04	1
Caelo	Salicylic acid	13H01-N04	2
Fagron	Salicylic acid	13K08-B31-290852	5
Fagron	Salicylic acid	13H01N08	1
Fagron	Salicylic acid	13K08-B31-290853	4
Phönix	Salicylic acid	13K08-B31-290853	1
Euro OTC	Salicylic acid	1406027-01	4
Gehe	Salicylic acid	1406027-01	1
Caelo	Salicylic acid	140602701	1
EuRho	Salicylic acid	1406027-01	1
Caelo	Salicylic acid	1406027-02	2
Euro OTC	Salicylic acid	140602702	1
EuRho	Salicylic acid	1406027-02	1
Caelo	Salicylic acid	14076201	3
Phönix Gotha	Salicylic acid	14076201	1
Phoenix	Salicylic acid	14076201	1
Caelo	Salicylic acid	14076203	7
Caesar&Loretz GmbH/Anzag	Salicylic acid	14076203	2
Caelo	Salicylic acid	14076206	5
Fagron	Salicylic acid	14076207	2
Caelo	Salicylic acid	14076212	1
Caelo	Salicylic acid	14076211	1
Caelo	Salicylic acid	14300801	5
Phönix Gotha	Salicylic acid	14300801	1
Caelo	Salicylic acid	14300804	4
Caesar&Loretz Anzag	Salicylic acid	14300804	2
Caelo	Salicylic acid	14300805	6
Caelo	Salicylic acid	14300806	1
Phoenix goettingen	Salicylic acid	14300808	1
Caelo	Salicylic acid	14300808	1
Caesar & Loretz GmbH	Salicylic acid	14300809	1
Caelo	Salicylic acid	14336904	1
Caelo	Salicylic acid	14336905	4
Caelo	Salicylic acid	1430802	1
Noweda	Salicylic acid	14336907	2
Caelo	Salicylic acid	14336908	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Salicylic acid	14B05-B30	3
Fagron	Salicylic acid	14B05B30	1
Caelo	Salicylic acid	14336912	3
Fagron	Salicylic acid	14B05-B30-290854	5
Fagron	Salicylic acid	14E26-B04	4
Fagron	Salicylic acid	14E26B04	1
Fagron	Salicylic acid	14E26-B04-294622	1
Euro OTC	Salicylic acid	14E26-B04-294622	1
Fagron	Salicylic acid	14E26B04294623	1
Fagron	Salicylic acid	14E26-B04-294623	2
Fagron	Salicylic acid	14E26-B04-294624	5
Fagron	Salicylic acid	14L02-B02	3
Fagron	Salicylic acid	14L02B02303557	1
Fagron	Salicylic acid	14L02-B02-303557	4
Fagron	Salicylic acid	14L02-B02-303558	4
Novacyl, FR	Salicylic acid	15084403	2
Caelo	Salicylic acid	15084401	2
Euro OTC	Salicylic acid	1509007-01	11
Sanacorp	Salicylic acid	15084404	1
Caelo	Salicylic acid	15084404	2
Caesar&Loretz/AHD	Salicylic acid	15211808	1
Caelo	Salicylic acid	15211806	2
Caesar&Loretz GmbH/Sana...	Salicylic acid	15217301	1
Caelo	Salicylic acid	15211810	2
Caelo	Salicylic acid	15217303	7
Caelo	Salicylic acid	15217304	4
Caelo	Salicylic acid	15217305	2
Caelo	Salicylic acid	15217308	4
Caelo	Salicylic acid	16010906	6
Caelo	Salicylic acid	1714Q1045	1
xxx	Salicylic acid	4311A-01045	1
Caelo	Salicylic acid	23071510	1
Sanacorp	Salicylic acid	68/AKD2	1
Caelo	Salicylic acid	18121412	1
Fagron	Salicylic acid	290852	1
Phönix	Salicylic acid	68/AKD4	1
Farmalabor / Farmalabor	Salicylic acid	P1404195-002	1
Caelo	Salicylic acid		7
Ichthyol/Noweda	Salicylic acid	13344003	1
Caaelo	Salicylic acid	14336911	1
Caelo	Salicylic acid	14336919	2
Caelo	Salicylic acid	15081601	1
EurRho/ Anzag	Salicylic acid	1509007-01	1
Phönix	Salicylic acid	1509007-02	1
Euro OTC	Salicylic acid	1509007-02	1
Caelo	Salicylic acid	15211807	2
Phoenix	Salicylic acid	15211808	2
Caelo	Salicylic acid	16010903	3
Ebert 24.08.16	Salicylic acid	16010903	1
Caelo	Salicylic acid	16010904	1
Caelo	Salicylic acid	16010905	1
Celo/ Sanacorp	Salicylic acid	16010908	1
Caelo	Salicylic acid	16050004	2
Caelo	Salicylic acid	16050005	1
Caelo	Salicylic acid	16050011	1
Caelo	Salicylic acid	16050012	1
Caelo	Salicylic acid	16E02-B09-325355	1
Caelo	Salicylic acid	1101301	1
Caelo	Salicylic acid	1738980	1
Caelo	Salicylic acid	8101204	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	9091301	1
Gehe 27.09.13	Salicylic acid	9220708	1
Caesar&loretz,Phoenix	Salicylic acid	9220710	1
Caelo	Salicylic acid	9220715	1
Fagron	Salicylic acid	102455-0002	2
Caelo	Salicylic acid	10291803	1
GEHE	Salicylic acid	102455-0002	1
Caelo	Salicylic acid	10291808	1
Caelo	Salicylic acid	10291804	2
Caelo	Salicylic acid	10291824	1
Caelo	Salicylic acid	10355911	3
Caelo	Salicylic acid	10355912	1
Caesar & Loretz GmbH 40...	Salicylic acid	10355916	1
Caelo	Salicylic acid	10355916	1
Anzag	Salicylic acid	1106014-01	1
Gehe	Salicylic acid	1106014-01	1
Euro OTC	Salicylic acid	1110020-01	3
Noweda	Salicylic acid	1110020-01	1
Caesar&loretz,Phoenix	Salicylic acid	11197104	1
Noweda	Salicylic acid	11197105	1
Spangropharm	Salicylic acid	11197104	1
Caelo	Salicylic acid	11197106	1
Caelo	Salicylic acid	11197118	1
Caelo	Salicylic acid	11197121	1
Fagron	Salicylic acid	11197121	1
VDL	Salicylic acid	11197122	1
Phönix, 02.11.2012	Salicylic acid	11197121	1
Noweda	Salicylic acid	11197123	2
Caelo	Salicylic acid	11197123	7
Phönix	Salicylic acid	11311902	1
Caelo	Salicylic acid	11311902	1
Noweda	Salicylic acid	11311903	1
Caelo	Salicylic acid	11311903	2
Gehe	Salicylic acid	11311904	1
Caelo	Salicylic acid	11311904	2
Caesar & Loretz GmbH D-...	Salicylic acid	11311904	1
Kehr	Salicylic acid	11311904	1
Caelo	Salicylic acid	11311905	1
Caelo	Salicylic acid	11311906	5
Anzag am 08.06.2012	Salicylic acid	11311906	1
Caelo	Salicylic acid	11311910	2
Caelo	Salicylic acid	11311916	2
Anzag 31.01.13 ek: 6,34EUR	Salicylic acid	11311916	1
Phönix	Salicylic acid	11311917	1
Ichthyol/Anzag	Salicylic acid	11311917	1
Caelo	Salicylic acid	11311917	4
Caesar & Loretz GmbH, 4...	Salicylic acid	11311917	1
Caelo	Salicylic acid	11311922	9
Sanacorp	Salicylic acid	11311922	1
Anzag 05.01.13	Salicylic acid	11311922	1
GEHE	Salicylic acid	11311922	1
Caesar & Loretz GmbH	Salicylic acid	11311922	1
Ichthyol	Salicylic acid	11311922	2
Phönix 17.06.2013	Salicylic acid	11311923	1
Euro OTC	Salicylic acid	115465478596	1
Caelo	Salicylic acid	1131922	1
Fagron	Salicylic acid	11B14-N13	1
Fagron	Salicylic acid	11K10-N01	4
Gehe	Salicylic acid	11D15-N08	1
Fagron	Salicylic acid	11L19-N21	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Großhandel	Salicylic acid	11K10-N01	1
Phönix	Salicylic acid	11127-N05	1
Caelo	Salicylic acid	12036202	6
Caelo	Salicylic acid	12036208	2
Caelo	Salicylic acid	12036209	5
Noweda	Salicylic acid	12036210	1
Caelo	Salicylic acid	12036210	2
Phönix Gotha	Salicylic acid	12036210	1
Caesar&lorenz,Anzag	Salicylic acid	12036211	1
Caelo	Salicylic acid	12036215	3
Alliance Healthcare	Salicylic acid	12036215	1
Noweda	Salicylic acid	12036215	1
Alliance Healthcare	Salicylic acid	12036216	1
Caelo	Salicylic acid	12036217	2
Caelo	Salicylic acid	12036223	8
Noweda	Salicylic acid	12036223	2
Bombastus	Salicylic acid	12036223	2
Noweda	Salicylic acid	12036226	1
EuRho	Salicylic acid	1206007-01	2
Euro OTC	Salicylic acid	1206007-01	9
Caelo	Salicylic acid	12036315	1
Gehe	Salicylic acid	1206007-01	1
Caelo	Salicylic acid	12134702	10
Caelo	Salicylic acid	12104709	1
AHD, 24.05.2013	Salicylic acid	12134707	1
Caelo	Salicylic acid	12134712	4
Sanacorp	Salicylic acid	12134712	1
Caelo	Salicylic acid	12134713	1
carlo	Salicylic acid	12134714	2
Sanacorp	Salicylic acid	12134715	1
Caelo	Salicylic acid	123134712	1
Caelo	Salicylic acid	12323401	1
Caelo	Salicylic acid	12323402	2
Phönix	Salicylic acid	12323401	1
Caelo	Salicylic acid	1234	1
Jenne	Salicylic acid	12345	1
Caelo	Salicylic acid	1234709	2
Caelo	Salicylic acid	12374205	12
Caelo	Salicylic acid	12374204	1
Caesar&Loretz GmbH/Anzag	Salicylic acid	12374204	1
Phönix Gotha	Salicylic acid	12374207	1
Caelo	Salicylic acid	12374210	3
Fagron	Salicylic acid	12C20-N12	6
Fagron	Salicylic acid	12C20-N04	1
Fagron	Salicylic acid	12H10-N03	6
Phönix	Salicylic acid	12C20-N12	1
Großhandel	Salicylic acid	12C20-N12	1
Großhandel	Salicylic acid	12H10-N03	1
Fagron	Salicylic acid	12H10-N08	7
Caelo	Salicylic acid	12H10-N08	3
Phoenix	Salicylic acid	12H10-No8	1
Fagron	Salicylic acid	12H1-N03	1
Phönix	Salicylic acid	1303020-01	1
Eurho/Phoenix	Salicylic acid	13B14-N01	2
Gehe	Salicylic acid	13B14-N01	1
Caelo	Salicylic acid	13B14-No1	2
Caelo	Salicylic acid	13H01-N01	1
Fagron	Salicylic acid	13H01N01	1
Caesar&lorenz,Phoenix	Salicylic acid	14076212	1
Fagron	Salicylic acid	14e26-b04-294623	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Salicylic acid	20111306	1
Caelo	Salicylic acid	1913Q-01045	1
Caelo	Salicylic acid	20151112-4	1
Caelo	Salicylic acid	20270312-2	1
Caelo	Salicylic acid	25041304	1
Caelo	Salicylic acid	3613A-01045	1
Caelo	Salicylic acid	3111J01045	1
Fagron	Salicylic acid	3111Q-01045	1
Caelo	Salicylic acid	4010Q-01045	1
Caelo	Salicylic acid	7466	1
Caelo	Salicylic acid	82732109	1
Fagron	Salicylic acid	RAS1135300	1
Caelo	Salicylic acid	A-100513-1	1
Caelo	Salicylic acid	Ch12134702	1
Fagron	Salicylic acid	xxxxxxx	1
Fagron	Salicylic acid	RAS1135100	1

- 55 136 spectra from 335 *Apo-Ident* customers from a total of 20 393 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Salicylic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Salicylic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	190	0	75 688
Type B	0	220	0	81 128
Type C	0	837	28	55 136

The substance/substance group *Salicylic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8421 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.2727 %)
Type C	100.0000 % (> 99.8622 %)	96.7630 % (> 96.4162 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20015	20015	0.00	61.47
20696	21906	4.17	57.34
21760	21906	1.64	57.49
21906	21906	0.00	56.54
22443	22443	0.00	55.21

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Selenium yeast**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20906-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Selenium yeast

Special notes

When selecting the *Selenium yeast* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Selenium yeast*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Selenium yeast	L1204012-01	20906	40	1403461
Caelo	Selenium yeast	13347911	21377	40	1509355

Validation samples

A total of 213 227 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 *Selenium yeast*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Selenium yeast*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Behr	Selenium yeast	P-07015253	20367	40
Euro OTC	Selenium yeast	L1401013-01	21102	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 batches from the substance/substance group *Selenium yeast*.

Supplier	Substance	Batch	Spectra
Caelo	Selenium yeast	12165708	1
Caesar & Loretz GmbH, 4...	Selenium yeast	11318111	1
Caelo	Selenium yeast	13347906	1
Caelo	Selenium yeast	13347911	1
Caelo	Selenium yeast	15276208	1
Euro OTC	Selenium yeast	L1210021-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Selenium yeast	L1401013-01	1
Euro OTC	Selenium yeast	L1503040-01	2
Euro OTC	Selenium yeast	L1404004-01	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Selenium yeast* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Selenium yeast* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	40	81 170
Type C	0	8	2	55 987

The substance/substance group *Selenium yeast* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	50.0000 % (> 46.2500 %)
Type C	100.0000 % (> 99.8627 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20906	20906	0.00	20.68
21377	21377	0.00	23.10

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sildenafil citrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20852-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sildenafil citrate; Sildenafil citras

Special notes

When selecting the *Sildenafil citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sildenafil citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sildenafil citrate	13F24-N03	20852	40	1402052
Fagron	Sildenafil citrate	13J15-N01	20927	80	20131030
Euro OTC	Sildenafil citrate	1311010-01	21621	40	20131209
Caelo	Sildenafil citrate	160498	22446	40	20160307*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 4 reference samples from the substance/substance group *Sildenafil citrate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Sildenafil citrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sildenafil citrate	1311010-01	21621 [†]	20
Caelo	Sildenafil citrate	160498	22446 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 45 spectra from 20 *Apo-Ident* customers from 27 batches from the substance/substance group *Sildenafil citrate*.

Supplier	Substance	Batch	Spectra
Caelo	Sildenafil citrate	2101403	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from 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
Euro OTC	Sildenafil citrate	13110-01	1
Euro OTC	Sildenafil citrate	1311010-01	3
Phönix/Polpharma	Sildenafil citrate	1311010-01	1
Gutenberg-Apotheke	Sildenafil citrate	1311010-01	1
Polpharma/Phoenix	Sildenafil citrate	131101001	1
Euro OTC	Sildenafil citrate	131101003	1
Euro OTC	Sildenafil citrate	1311010-03	2
Phönix	Sildenafil citrate	1311010-04	2
Fagron	Sildenafil citrate	13J15-N01	3
Euro OTC	Sildenafil citrate	14051402	1
Caelo	Sildenafil citrate	14074707	1
Caelo	Sildenafil citrate	14074710	1
Caelo	Sildenafil citrate	14074709	1
Caelo	Sildenafil citrate	14074714	5
Caelo	Sildenafil citrate	14074715	3
Caelo	Sildenafil citrate	14074716	1
Caelo	Sildenafil citrate	1407474	1
Fagron	Sildenafil citrate	14A08-b04-290225	1
Fagron	Sildenafil citrate	14H11-B01-303183	1
Caelo	Sildenafil citrate	15097301	1
Caelo	Sildenafil citrate	15097307	1
Caelo	Sildenafil citrate	15097306	1
Caelo	Sildenafil citrate	15097303	1
Caelo	Sildenafil citrate	15097312	2
Caelo	Sildenafil citrate	16049802	3
Euro OTC	Sildenafil citrate	17061405	1
Gehe	Sildenafil citrate	13F24-N03	1
Euro OTC	Sildenafil citrate	17081504	1
Caelo	Sildenafil citrate	1311010-01	1

- 55 956 spectra from 335 *Apo-Ident* customers from a total of 20 584 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sildenafil citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sildenafil citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	40	0	81 308
Type C	0	45	0	55 956

The substance/substance group *Sildenafil citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 86.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20852	20852	0.00	36.99
20927	20852	4.54	37.88
21621	20852	10.80	38.00
22446	22446	0.00	43.56

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium acetate trihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20984-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium acetate trihydrate; Natrii acetas trihydricum; Natrii aceticum

Special notes

When selecting the *Sodium acetate trihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium acetate trihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium acetate t...	12316506	20984	40	1402111
Caelo	Sodium acetate t...	13411404	21441	40	20140113
Euro OTC	Sodium acetate t...	1507020	21861	40	0000010626

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sodium acetate trihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Sodium acetate trihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Sodium acetate trihydrate	pending	20157	40
Caelo	Sodium acetate trihydrate	13411404	21441 [†]	20
Euro OTC	Sodium acetate trihydrate	1507020	21861 [†]	20
Caelo	Sodium acetate trihydrate	163007	22760	40
Euro OTC	Sodium acetate trihydrate	1608032	22802	40

- 81 188 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 22 spectra from 15 *Apo-Ident* customers from 13 batches from the substance/substance group *Sodium acetate trihydrate*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Sodium acetate trihydrate	13411404	1
Gehe	Sodium acetate trihydrate	13411412	3
Caelo	Sodium acetate trihydrate	15145204	3
Caelo	Sodium acetate trihydrate	15118701	1
Caelo	Sodium acetate trihydrate	13411418	2
Ebert KKH 13.10.16	Sodium acetate trihydrate	15145204	1
Ebert KKH 13.10.16	Sodium acetate trihydrate	15145209	1
Caelo	Sodium acetate trihydrate	12027203	1
Caelo	Sodium acetate trihydrate	10353017	1
Caelo	Sodium acetate trihydrate	12316506	1
Caelo	Sodium acetate trihydrate	12027202	3
Phönix Gotha	Sodium acetate trihydrate	12316506	1
Caelo	Sodium acetate trihydrate	12027217	1
Caelo	Sodium acetate trihydrate	12027228	1
Caelo	Sodium acetate trihydrate	12027211	1

- 55 979 spectra from 335 *Apo-Ident* customers from a total of 20 598 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium acetate trihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium acetate trihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	145	15	81 188
Type C	0	22	0	55 979

The substance/substance group *Sodium acetate trihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	90.6250 % (> 88.7500 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 72.7273 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20984	20984	0.00	34.53
21441	20984	2.79	34.37
21861	21861	0.00	36.57

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium alginate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20486-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium alginate; Natrii alginas; Natrii alginicum

Special notes

When selecting the *Sodium alginate* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium alginate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium alginate	11K17-N12	20486	40	AR-13-FG-002913-01
Fagron	Sodium alginate	14G22-B99-297091	21807	40	20140813

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Sodium alginate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Sodium alginate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sodium alginate	14G22-B99-297091	21807 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Sodium alginate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *Sodium alginate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium alginate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 798
Type B	0	20	0	81 328
Type C	0	0	0	56 001

The substance/substance group *Sodium alginate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20486	20486	0.00	29.17
21807	20486	16.90	29.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium ascorbate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20520-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium ascorbate; Natrii ascorbas; Natrii ascorbinicum

Special notes

When selecting the *Sodium ascorbate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium ascorbate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium ascorbate	05061206	20520	40	AR-13-FG-008606-01
Euro OTC	Sodium ascorbate	1406018-01	21583	40	1411165
Euro OTC	Sodium ascorbate	1406018-01	21789	40	20140724
Euro OTC	Sodium ascorbate	1507030	21853	40	0000010674
Euro OTC	Sodium ascorbate	1506018	21865	40	20150706*
Euro OTC	Sodium ascorbate	1510017	21946	40	20151102*
Euro OTC	Sodium ascorbate	1601007	22304	40	20160120*
Caelo	Sodium ascorbate	15429905	22899	40	20160118

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 320 spectra of 8 reference samples from the substance/substance group *Sodium ascorbate*. These samples are listed above in the [calibration samples](#) section.
- 75 558 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 280 spectra of 10 reference samples from the substance/substance group *Sodium ascorbate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium ascorbate	1406018-01	21583 [†]	20
Euro OTC	Sodium ascorbate	1406018-01	21789 [†]	20
Euro OTC	Sodium ascorbate	1507030	21853 [†]	20
Euro OTC	Sodium ascorbate	1506018	21865 [†]	20
Euro OTC	Sodium ascorbate	1510017	21946 [†]	20
Euro OTC	Sodium ascorbate	1601007	22304 [†]	20
Euro OTC	Sodium ascorbate	1604001	22524	40
Euro OTC	Sodium ascorbate	1607044	22690	40
Caelo	Sodium ascorbate	162857	22761	40
Euro OTC	Sodium ascorbate	1611015	22864	40

- 81 068 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *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 4 *Apo-Ident* customers from 16 batches from the substance/substance group *Sodium ascorbate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium ascorbate	1210026-01	1
Euro OTC	Sodium ascorbate	L1308005-01	1
Euro OTC	Sodium ascorbate	11081401	1
Euro OTC	Sodium ascorbate	12061407	1
Euro OTC	Sodium ascorbate	13031402	1
Caelo	Sodium ascorbate	14079404	1
Euro OTC	Sodium ascorbate	13051406	1
Euro OTC	Sodium ascorbate	4021401	1
Euro OTC	Sodium ascorbate	11121301	1
Euro OTC	Sodium ascorbate	7011405	1
Caelo	Sodium ascorbate	15180505	1
Fagron	Sodium ascorbate	L1308005-01	1
Euro OTC	Sodium ascorbate	16091301	1
Euro OTC	Sodium ascorbate	20091303	1
Caelo	Sodium ascorbate	27091302	1
Euro OTC	Sodium ascorbate	28081304	1
Caelo	Sodium ascorbate	L1210026-01	1

- 55 984 spectra from 335 *Apo-Ident* customers from a total of 20 595 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium ascorbate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium ascorbate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	320	0	75 558
Type B	0	280	0	81 068
Type C	0	17	0	55 984

The substance/substance group *Sodium ascorbate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.1250 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.8571 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20520	20520	0.00	69.18
21583	21583	0.00	71.53
21789	21865	4.68	69.11
21853	21853	0.00	71.35
21865	21865	0.00	70.55
21946	21946	0.00	71.37
22304	22304	0.00	64.57
22899	22304	2.99	64.25

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium benzoate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20479-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium benzoate; Natrii benzoas; Natrii benzoicum

Special notes

When selecting the *Sodium benzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium benzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium benzoate	10A08-N04	20479	40	AR-13-FG-003105-01
Caelo	Sodium benzoate	11267016	20752	40	20110923
Caelo	Sodium benzoate	13178619	21607	40	20130624
Euro OTC	Sodium benzoate	1409040-01	21713	40	20141021
Euro OTC	Sodium benzoate	1506019	21825	40	0000010378
Euro OTC	Sodium benzoate	1510044	22236	40	20151109*
Euro OTC	Sodium benzoate	1602020	22363	40	20160225*
Euro OTC	Sodium benzoate	1610037	22867	40	20161202*
Euro OTC	Sodium benzoate	1701045	22997	40	20170207*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 360 spectra of 9 reference samples from the substance/substance group *Sodium benzoate*. These samples are listed above in the [calibration samples](#) section.
- 75 518 spectra from a total of 1567 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 280 spectra of 9 reference samples from the substance/substance group *Sodium benzoate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium benzoate	90834189	20191	40
Caelo	Sodium benzoate	13178619	21607 [†]	20
Euro OTC	Sodium benzoate	1409040-01	21713 [†]	20
Euro OTC	Sodium benzoate	1506019	21825 [†]	20
Euro OTC	Sodium benzoate	1510044	22236 [†]	20
Euro OTC	Sodium benzoate	1602020	22363 [†]	20
Caelo	Sodium benzoate	161371	22474	60
Euro OTC	Sodium benzoate	1607005	22670	40
Fagron	Sodium benzoate	15B16-B07-308570	22895	40

- 81 068 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 136 spectra from 89 *Apo-Ident* customers from 70 batches from the substance/substance group *Sodium benzoate*.

Supplier	Substance	Batch	Spectra
Caelo	Sodium benzoate	15044104	5
Euro OTC	Sodium benzoate	1304024-01	5
Euro OTC	Sodium benzoate	1506019-01	3
Euro OTC	Sodium benzoate	1510044-01	3
Caelo	Sodium benzoate	15363409	2
Caelo	Sodium benzoate	12158419	6
Caelo	Sodium benzoate	11267013	1
Caelo	Sodium benzoate	14166714	1
Fagron	Sodium benzoate	12H08-N06	2
Fagron	Sodium benzoate	13/27-B03-288805	1
Fagron	Sodium benzoate	13/27B03288805	1
Euro OTC	Sodium benzoate	1309027-01	1
Caelo	Sodium benzoate	13178603	3
Euro OTC	Sodium benzoate	1307013-01	1
Caelo	Sodium benzoate	13178613	1
Caelo	Sodium benzoate	13178619	2
Caelo	Sodium benzoate	13178635	3
Caelo	Sodium benzoate	13178643	1
Caelo	Sodium benzoate	13178647	2
Fagron	Sodium benzoate	13I27-B03-288806	3
Fagron	Sodium benzoate	13H01-N02	1
Phoenix goettin	Sodium benzoate	13I27-B03-288806	1
Fagron	Sodium benzoate	13C14-N01	1
Fagron	Sodium benzoate	13J27-B03	1
Fagron	Sodium benzoate	13I27-Bo3-288805	1
Euro OTC	Sodium benzoate	1404011-01	4
Euro/ Phönix	Sodium benzoate	1404011-01	1
Unisan	Sodium benzoate	1404011-01	1
Euro OTC	Sodium benzoate	1409040-01	1
Fagron	Sodium benzoate	1412	1
Fagron	Sodium benzoate	14E12-B07	1
Fagron	Sodium benzoate	14E12B07296717	1
Fagron	Sodium benzoate	14E12Bo7296717	1
Caelo	Sodium benzoate	15044102	5
Fagron	Sodium benzoate	14E12B07296717	1
Phönix	Sodium benzoate	1510044/01	1
Caelo	Sodium benzoate	15135001	3
Caelo	Sodium benzoate	15363401	4
Caelo	Sodium benzoate	15363424	1
Fagron	Sodium benzoate	15B16-B07-306571	2
Fagron	Sodium benzoate	1602020-01	1
Caelo	Sodium benzoate	24021501	1
Caelo	Sodium benzoate	2215Q-01891	1
Caelo	Sodium benzoate	4315A-01891	1
Euro OTC	Sodium benzoate	1112006-01	1
Euro OTC	Sodium benzoate	1007019-01	1
EuRho	Sodium benzoate	1112006-01	1
Caelo	Sodium benzoate	11267007	2
Caelo	Sodium benzoate	1209018-0	1
Phönix 18.09.12	Sodium benzoate	1204011-01	2
Caelo	Sodium benzoate	11346113	1
Euro OTC	Sodium benzoate	1209018-01	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Noweda	Sodium benzoate	1209018-01	1
Euro OTC	Sodium benzoate	1209018-18	1
Caelo	Sodium benzoate	12158401	1
Anzag 19.11.2012	Sodium benzoate	12158402	1
Caelo	Sodium benzoate	12158414	1
Caelo	Sodium benzoate	12158418	1
Caelo	Sodium benzoate	12158424	1
Caelo	Sodium benzoate	12158439	3
Fagron	Sodium benzoate	1250	1
Fagron	Sodium benzoate	12C05-N04	1
Fagron	Sodium benzoate	12G04-N04	1
Fagron	Sodium benzoate	12D02-N06	1
Fagron	Sodium benzoate	12J23-N05	3
Phönix 04.03.2013	Sodium benzoate	12J23-N05	1
Phönix	Sodium benzoate	12J23-N05	2
Caelo	Sodium benzoate	12J23-N05	1
Fiebig 27.06.13 EK3,34	Sodium benzoate	1304024-01	1
EuRho Anzag	Sodium benzoate	1304024-01	1
Euro OTC	Sodium benzoate	130402401	2
Alliance Healthcare	Sodium benzoate	1304024-01	1
Caelo	Sodium benzoate	13178605	1
Caelo	Sodium benzoate	13178627	1
Fagron	Sodium benzoate	13C14-N01	4
Fagron	Sodium benzoate	1913A-01981	1
Fagron	Sodium benzoate	24011401	1
Caelo	Sodium benzoate	17061306	1
Euro OTC	Sodium benzoate	2604040V-05	1
Caelo	Sodium benzoate	52111I-01891	1
Fagron	Sodium benzoate	test	1

- 55 865 spectra from 335 *Apo-Ident* customers from a total of 20 542 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium benzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium benzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	360	0	75 518
Type B	0	254	26	81 068
Type C	0	130	6	55 865

The substance/substance group *Sodium benzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.3333 %)
Type B	100.0000 % (> 99.9853 %)	90.7143 % (> 89.6429 %)
Type C	100.0000 % (> 99.8622 %)	95.5882 % (> 93.3824 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20479	20479	0.00	26.78
20752	22363	6.95	28.52
21607	22363	5.90	30.79
21713	22236	6.10	29.54
21825	21825	0.00	20.53
22236	22236	0.00	25.53
22363	22363	0.00	33.91
22867	22867	0.00	33.55
22997	22997	0.00	33.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium citrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20662-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium citrate; Natrii citras; Natrii citricum

Special notes

When selecting the *Sodium citrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium citrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium citrate	12E04-N05	20662	40	20120516
Caelo	Sodium citrate	12045026	20918	40	20120307
Caelo	Sodium citrate	13089335	21670	40	AR-15-FG-000405-01
Caelo	Sodium citrate	14112517	21718	40	20140416
Fagron	Sodium citrate	14A13-B02-294541	21778	40	20140424
Euro OTC	Sodium citrate	1506041	21839	40	0000010492

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium citrate	1511017	21997	40	20151130*
Fagron	Sodium citrate	16F10-B01-326088	22843	40	20160711
Euro OTC	Sodium citrate	1610016	22859	40	20161102*
Euro OTC	Sodium citrate	1701029	22996	40	20170126*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 400 spectra of 10 reference samples from the substance/substance group *Sodium citrate*. These samples are listed above in the [calibration samples](#) section.
- 75 478 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 300 spectra of 10 reference samples from the substance/substance group *Sodium citrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium citrate	1205026-01	20652	40
Caelo	Sodium citrate	12045008	20656	40
Caelo	Sodium citrate	13089335	21670 [†]	20
Caelo	Sodium citrate	14112517	21718 [†]	20
Fagron	Sodium citrate	14A13-B02-294541	21778 [†]	20
Euro OTC	Sodium citrate	1506041	21839 [†]	20
Euro OTC	Sodium citrate	1511017	21997 [†]	20
Euro OTC	Sodium citrate	1604030	22510	40
Caelo	Sodium citrate	162179	22618	40
Euro OTC	Sodium citrate	1607040	22687	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 81 048 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 483 spectra from 201 *Apo-Ident* customers from 170 batches from the substance/substance group *Sodium citrate*.

Supplier	Substance	Batch	Spectra
Fagron	Sodium citrate	13A07-N01	8
Caelo	Sodium citrate	13089317	5
Euro OTC	Sodium citrate	1305001-01	12
Euro OTC	Sodium citrate	1311035-01	20
Caelo	Sodium citrate	14112518	2
Caelo	Sodium citrate	16095702	1
Euro OTC	Sodium citrate	1412014-01	10
Caelo	Sodium citrate	14369413	8
Caelo	Sodium citrate	14369406	1
Caelo	Sodium citrate	14369407	19
Euro OTC	Sodium citrate	1511017-01	6
Caelo	Sodium citrate	14369423	3
Caelo	Sodium citrate	11304311	5
Euro OTC	Sodium citrate	1506041-01	8
Caelo	Sodium citrate	14369408	1
Caelo	Sodium citrate	11219012	5
Caelo	Sodium citrate	12045008	6
Noweda	Sodium citrate	1205026-01	1
Caelo	Sodium citrate	1234	3
Fagron	Sodium citrate	13B28-N02	4
Caelo	Sodium citrate	12045011	5
Euro OTC	Sodium citrate	1211030-01	11
Caelo	Sodium citrate	12897	1
Fagron	Sodium citrate	13/24-B13-287921	3
Fagron	Sodium citrate	13I24-B13-287921	2
Caelo	Sodium citrate	13089335	6
Caelo	Sodium citrate	14112502	15
Caelo	Sodium citrate	14112504	2
Fagron	Sodium citrate	14A13b02300395	1
Caelo	Sodium citrate	14112511	1
Caelo	Sodium citrate	14112517	6
Caelo	Sodium citrate	12045016-3451311172	1
Caelo	Sodium citrate	12045024	3
Caelo	Sodium citrate	12045020	2
Caelo	Sodium citrate	12045026	9
Caelo	Sodium citrate	13089309	4
Caelo	Sodium citrate	13089306	1
Sanacorp	Sodium citrate	13089308	1
Caelo	Sodium citrate	13089313	3
Herbasinica	Sodium citrate		2
Euro OTC	Sodium citrate		4
Caelo	Sodium citrate	50815PMS01	1
Euro OTC	Sodium citrate	815757/6745	1
Gatt-Koller	Sodium citrate	1073/04121412	1
Fagron	Sodium citrate	815Q-01900	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium citrate	1107011-02	2
Caelo	Sodium citrate	11081514	1
Fagron	Sodium citrate	1161207	3
Caelo	Sodium citrate	1151351	2
Caelo	Sodium citrate	1123588946	1
Caelo	Sodium citrate	1161207	2
Fagron	Sodium citrate	1172108	1
Fagron	Sodium citrate	1176767	2
Caelo	Sodium citrate		9
Euro OTC	Sodium citrate	12345	2
Euro OTC	Sodium citrate	1205026-02	3
Caelo	Sodium citrate	123456	1
Caelo	Sodium citrate	123456789	1
Caelo	Sodium citrate	123658	1
Caelo	Sodium citrate	123test	2
Caelo	Sodium citrate	123Test	3
Caelo	Sodium citrate	1256825	1
Caelo	Sodium citrate	128896	1
Caelo	Sodium citrate	125874566	1
Fagron	Sodium citrate	12J26-N02	3
Caelo	Sodium citrate	13/24-B13-287921	1
Caelo	Sodium citrate	13089305	1
Caelo	Sodium citrate	13089318	1
Caelo	Sodium citrate	13089308	8
Caelo	Sodium citrate	13089314	1
Caelo	Sodium citrate	13089319	4
Caelo	Sodium citrate	13089325	3
Caelo	Sodium citrate	13089331	7
Caelo	Sodium citrate	13089326	1
Sanacorp	Sodium citrate	13089331	1
Bombastus	Sodium citrate	13089334	1
Caesar & Loretz GmbH	Sodium citrate	13089334	1
Caelo	Sodium citrate	131103501	1
Sanacorp	Sodium citrate	1311035-01	1
Gehe	Sodium citrate	1311035-01	1
Caelo	Sodium citrate	1389318	1
Fagron	Sodium citrate	13A07-N01	1
Caelo	Sodium citrate	13B28-N02	3
Fagron	Sodium citrate	13E27-N12	1
Euro OTC	Sodium citrate	1404033-01	6
Euro OTC	Sodium citrate	13I24-B13-287921	1
Fagron	Sodium citrate	13D09-N01	4
Euro OTC	Sodium citrate	140403301	3
Caelo	Sodium citrate	1404033-01	3
Gehe/Euro	Sodium citrate	1404033-01	2
Euro OTC	Sodium citrate	14112014-01	1
Caesar&Loretz GmbH	Sodium citrate	14112502	1
Caesar & Loretz GmbH	Sodium citrate	14112517	1
Gehe/Euro	Sodium citrate	1412014-01	6
Caelo	Sodium citrate	14112520	1
EuRho	Sodium citrate	1412014-01	1
Sanacorp	Sodium citrate	1436407	1
Euro OTC	Sodium citrate	14201401	1
Caelo	Sodium citrate	14369402	3
Caesar&Loretz GmbH/Anzag	Sodium citrate	14369407	1
Caelo	Sodium citrate	14369411	2
Caelo	Sodium citrate	14838	1
Sanacorp 17.08.2016	Sodium citrate	14369424	2
Caelo	Sodium citrate	14369415	1
Fagron	Sodium citrate	14A13-B02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Sodium citrate	14A13-B02-294541	4
Fagron	Sodium citrate	14A13-B02-300395	3
Phoenix	Sodium citrate	1506041-01	2
Caelo	Sodium citrate	1506041-01	1
Phoenix	Sodium citrate	1511017-01	2
Euro OTC	Sodium citrate	151101701	1
Caelo	Sodium citrate	1511017-01	3
Euro OTC	Sodium citrate	156422	1
Fagron	Sodium citrate	15C27-B01-309893	1
Caelo	Sodium citrate	154662	1
Fagron	Sodium citrate	15C27-B01-3211097	1
Euro OTC	Sodium citrate	16070-01	1
Euro OTC	Sodium citrate	1607040-01	1
Eurho/ Noweda	Sodium citrate	1607040-01	1
Caelo	Sodium citrate	1607040-01	1
Euro OTC	Sodium citrate	1610016-01	1
Euro OTC	Sodium citrate	1645265	3
Euro OTC	Sodium citrate	17061407	1
EuRho	Sodium citrate	1607040-01	1
Euro OTC	Sodium citrate	2114M1900	1
Caelo	Sodium citrate	17081501	1
Caelo	Sodium citrate	220914PML01	1
Euro OTC	Sodium citrate	25425	2
Caelo	Sodium citrate	2413A-01900	1
Euro OTC	Sodium citrate	2546426	1
Euro OTC	Sodium citrate	3454	1
Caelo	Sodium citrate	459842	1
Caelo	Sodium citrate	TestmessungnachRep	1
Euro OTC	Sodium citrate	358528	1
Caelo	Sodium citrate	Test	1
Bombastus	Sodium citrate	73155098	1
Caelo	Sodium citrate	70214PJK01	1
Fagron	Sodium citrate	712A-01900	1
Euro OTC	Sodium citrate	1004010-01	1
Euro OTC	Sodium citrate	1107011-01	1
anzag,12.12.12	Sodium citrate	1049088	1
Caelo	Sodium citrate	1111111	1
Euro OTC	Sodium citrate	1107011-02	1
EuRho	Sodium citrate	1107011-02	1
Caelo	Sodium citrate	713A-01900	1
Noweda	Sodium citrate	11127001	1
Caelo	Sodium citrate	11121303	1
Caelo	Sodium citrate	11304305	1
Caelo	Sodium citrate	11304312	2
Test	Sodium citrate		1
Fagron	Sodium citrate	11L05-N01	1
Phönix 19.12.2012	Sodium citrate	12/10-N01	1
Caelo	Sodium citrate	12045001	1
Caelo	Sodium citrate	12045002	1
Noweda	Sodium citrate	12045004	1
Caelo	Sodium citrate	12045004	3
Caelo	Sodium citrate	12045005	3
Caelo	Sodium citrate	12045006	1
Caelo	Sodium citrate	12045007	1
Caelo	Sodium citrate	12045012	2
Caelo	Sodium citrate	12045016	5
Caelo	Sodium citrate	12045017	2
Caelo	Sodium citrate	12045019	5
Caelo	Sodium citrate	12045021	1
Erika apotheke	Sodium citrate	12045020	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Noweda	Sodium citrate	12045026	1
Anzag	Sodium citrate	1205026-02	1
EuRho	Sodium citrate	1205026-02	1
Phönix/EuRho	Sodium citrate	1205026-02	1
Phönix	Sodium citrate	1205026-02	1
Gehe	Sodium citrate	1211030-01	1
Alliance Healthcare	Sodium citrate	1211030-01	1
Phönix	Sodium citrate	1211030-01	3
Caelo	Sodium citrate	121103001	1
Fagron	Sodium citrate	12339502	1
Test	Sodium citrate	1234	1
Fagron	Sodium citrate	12A05-N04	4
Caelo	Sodium citrate	12345678	1
Fagron	Sodium citrate	12E04-N05	2
Fagron	Sodium citrate	12I10-N01	1
Euro/Phönix	Sodium citrate	1305001-01	1
anzag, 14.12.2012	Sodium citrate	12110-N06	1
Caelo	Sodium citrate	1308908	1
Caelo	Sodium citrate	13089304	3
Euro OTC	Sodium citrate	1311025-01	1
Caelo	Sodium citrate	13089329	1
Euro OTC	Sodium citrate	1413M-01900	1
Euro OTC	Sodium citrate	20200810-6	1
Caelo	Sodium citrate	21121203	1
Fagron	Sodium citrate	3311E-01900	1
Caelo	Sodium citrate	25383143	1
Euro OTC	Sodium citrate	22101305	1
Caelo	Sodium citrate	4351235	1
Caelo	Sodium citrate	22131-01900	1
Fagron	Sodium citrate	31051202	1
Caelo	Sodium citrate	4111Q-01900	1
Euro OTC	Sodium citrate	2903001-01	1
Fagron	Sodium citrate	24121301	1
fragon	Sodium citrate		1
Euro OTC	Sodium citrate	30111301	1
Caelo	Sodium citrate	49131-01900	1
EuRho	Sodium citrate	4611M-01900	1
Caelo	Sodium citrate	8/AKD41	1
Caelo	Sodium citrate	K-280313-1	1
Unisan	Sodium citrate	S/WReferenzUmstell	1
HiperScan	Sodium citrate		1
Phönix Gotha	Sodium citrate	52666276	1
Fagron	Sodium citrate	Probe	1
Caelo	Sodium citrate	15C27-B01-309893	1
Fagron	Sodium citrate	15C27-B01-312231	1
Phönix	Sodium citrate	12045024	1
Fagron	Sodium citrate	14A13-B02-3003955	1
Großhandel	Sodium citrate	12045026	1
Caelo	Sodium citrate	1204521	1

- 55 518 spectra from 335 *Apo-Ident* customers from a total of 20 450 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium citrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium citrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	400	0	75 478
Type B	0	300	0	81 048
Type C	0	481	2	55 518

The substance/substance group *Sodium citrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.5000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.0000 %)
Type C	100.0000 % (> 99.8622 %)	99.5859 % (> 98.9648 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20662	21839	3.31	32.29
20918	21670	5.31	29.46
21670	21670	0.00	27.11
21718	21670	2.97	29.70
21778	21670	3.20	29.44
21839	21839	0.00	35.28
21997	21997	0.00	38.56
22843	21839	5.47	44.64
22859	22859	0.00	35.14
22996	22996	0.00	40.65

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium cromoglicate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20775-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium cromoglicate; Natrii cromoglicas; Natrii cromoglicinum

Special notes

When selecting the *Sodium cromoglicate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium cromoglicate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium cromoglic...	12C09-N02	20775	79	1401553
Caelo	Sodium cromoglic...	11114501	20776	80	20110518
Euro OTC	Sodium cromoglic...	1112003-01	20778	40	20120426
Fagron	Sodium cromoglic...	13G24-N04	21260	40	20130515
Caelo	Sodium cromoglic...	13232802	21375	20	1505352
Caelo	Sodium cromoglic...	13232802	21376	80	20130905
Euro OTC	Sodium cromoglic...	1403017-01	21981	40	20140505
Caelo	Sodium cromoglic...	15224404	21990	40	20150625
Euro OTC	Sodium cromoglic...	1510018	22231	40	20151109*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 459 spectra of 9 reference samples from the substance/substance group *Sodium cromoglicate*. These samples are listed above in the [calibration samples](#) section.
- 75 419 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 380 spectra of 10 reference samples from the substance/substance group *Sodium cromoglicate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium cromoglicate	11114502	20289	40
Caelo	Sodium cromoglicate	13232802	21376 [†]	20
Euro OTC	Sodium cromoglicate	1403017-01	21981 [†]	20
Caelo	Sodium cromoglicate	15224404	21990 [†]	20
Euro OTC	Sodium cromoglicate	1510018	22231 [†]	20
Fagron	Sodium cromoglicate	15C23-B01-307751	22972	40
Euro OTC	Sodium cromoglicate	1403017-01	21981SI	60
Caelo	Sodium cromoglicate	15224404	21990SI	60
Euro OTC	Sodium cromoglicate	1510018	22231SI	60
Fagron	Sodium cromoglicate	15C23-B01-307751	22972SI	40

- 80 968 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *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 8 batches from the substance/substance group *Sodium cromoglicate*.

Supplier	Substance	Batch	Spectra
Fagron	Sodium cromoglicate	13G24-N04	1
Caelo	Sodium cromoglicate	5113A-02831	1
Fagron	Sodium cromoglicate	12D26-N12	1
Fagron	Sodium cromoglicate	13E22-N11	1
Euro OTC	Sodium cromoglicate	1403017-01	1
Caelo	Sodium cromoglicate	12301101	2
Caelo	Sodium cromoglicate	15224404	1
Caelo	Sodium cromoglicate	12301102	1

- 55 992 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium cromoglicate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium cromoglicate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	459	0	75 419
Type B	0	176	204	80 968
Type C	0	9	0	55 992

The substance/substance group *Sodium cromoglicate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6928 %)
Type B	100.0000 % (> 99.9853 %)	46.3158 % (> 45.5263 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20775	20775	0.00	57.01
20776	22231	19.35	72.46
20778	22231	29.11	72.79
21260	22231	7.40	65.47
21375	21375	0.00	70.82
21376	21375	6.88	73.57
21981	22231	18.43	67.30
21990	22231	17.22	68.73
22231	22231	0.00	62.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium cyclamate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20917-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium cyclamate; Natrii cyclamas; Natrii cyclamicum

Special notes

When selecting the *Sodium cyclamate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium cyclamate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium cyclamate	12256803	20917	40	1401418
Caelo	Sodium cyclamate	12105622	21380	40	20120423

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Sodium cyclamate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 1 reference samples from the substance/substance group *Sodium cyclamate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium cyclamate	9350509	20137	60

- 81 288 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 batches from the substance/substance group *Sodium cyclamate*.

Supplier	Substance	Batch	Spectra
Caelo	Sodium cyclamate	13359807	1
Caelo	Sodium cyclamate	12105613	1
Caelo	Sodium cyclamate	12105618	2
Caelo	Sodium cyclamate	12256807	1
Phoenix	Sodium cyclamate	787/03100611	1
Caesar & Loretz GmbH	Sodium cyclamate	12105622	1
Caelo	Sodium cyclamate	12105622	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium cyclamate	15201601	1
Caelo	Sodium cyclamate	10380915	2
Caelo	Sodium cyclamate	11204205	1
anzag,13.12.12	Sodium cyclamate	12256803	1
Caelo	Sodium cyclamate	12256803	1

- 55 987 spectra from 335 *Apo-Ident* customers from a total of 20 601 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium cyclamate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium cyclamate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	50	10	81 288
Type C	0	12	2	55 987

The substance/substance group *Sodium cyclamate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	83.3333 % (> 78.3333 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20917	20917	0.00	71.16
21380	20917	13.19	72.00

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium edetate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20937-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium edetate; Dinatrii edetas; Natrii aethylendiaminum tetraaceticum

Special notes

When selecting the *Sodium edetate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium edetate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Sodium edetate	13E15-N05	20937	40	1402193
Caelo	Sodium edetate	13142009	21362	40	20130524
Caelo	Sodium edetate	161364	22465	40	20160504*
Euro OTC	Sodium edetate	1609023	22915	40	20170106*
Fagron	Sodium edetate	16F21-B02-325085	22926	40	20160713
Euro OTC	Sodium edetate	1609023-01	22950	40	20170106

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Sodium edetate*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 73 spectra of 3 reference samples from the substance/substance group *Sodium edetate*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sodium edetate	10C10-N04	20190	40
Caelo	Sodium edetate	161364	22465 [†]	20
Caelo	Sodium edetate	15427714	not required	13

- 81 275 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 217 spectra from 126 *Apo-Ident* customers from 80 batches from the substance/substance group *Sodium edetate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium edetate	13142018	1
Fagron	Sodium edetate	13K19-B02-290051	4
Caelo	Sodium edetate	15116603	7
Caelo	Sodium edetate	15427717	2
Caelo	Sodium edetate	15427703	2
Fagron	Sodium edetate	601EB174	1
GEHE	Sodium edetate	11074702	1
Caelo	Sodium edetate	12181714	2
Fagron	Sodium edetate	914E-01925	1
Caelo	Sodium edetate	13/23-N03-3472312131	1
Fagron	Sodium edetate	13K19-B02	2
Fagron	Sodium edetate	13I23-N03	7
Fagron	Sodium edetate	13k19-b02-290051	1
Caelo	Sodium edetate	12181711	12
Caelo	Sodium edetate	13142004	3
Caelo	Sodium edetate	13142008	7
Fagro/Gehe	Sodium edetate	601H1300	1
Caelo	Sodium edetate	13142002	4
Caelo	Sodium edetate	13142009	6
Caelo	Sodium edetate	13142014	1
Caelo	Sodium edetate	13142010	3
Caelo	Sodium edetate	13142015	6
phönix	Sodium edetate	13142018	1
Caelo	Sodium edetate	13142018	1
Caelo	Sodium edetate	13395002	3
Caelo	Sodium edetate	13395007	4
phönix	Sodium edetate	13K19-B02-290051	1
Caelo	Sodium edetate	13K19-B02-290051	1
Fagron	Sodium edetate	13K19-B02-290052	3
Caelo	Sodium edetate	14270505	3
Caelo	Sodium edetate	14270506	3
Caelo	Sodium edetate	15427714	2
Caelo	Sodium edetate	12181702	1
Caelo	Sodium edetate	2101414	1
Fagron	Sodium edetate	215I-01925	1
Fagron	Sodium edetate	13/23-N03	4
Caelo	Sodium edetate	12G25-N12	1
Phönix	Sodium edetate	13E15-B10	1
Fagron	Sodium edetate	13E15-B10-289034	1
Fagron	Sodium edetate	13E15-N05	10
Caelo	Sodium edetate	13E15-N05	5
Phönix	Sodium edetate	13G15-N03	1
Phoenix Goettin	Sodium edetate	13G15-N03	1
Phoenix Goettin	Sodium edetate	13G15-N03	1
Fagron	Sodium edetate	13I23-N03	1
Fagron	Sodium edetate	13K19-B02-289035	1
Fagron	Sodium edetate	13K19B02290051	1
Fagron	Sodium edetate	13K19B02	1
Fagron	Sodium edetate	13K-19-B02-290051	1
Caelo	Sodium edetate	1427006	1
Caesar & Loretz GmbH	Sodium edetate	14270505	1
Fagron	Sodium edetate	14G03-B05	4
Fagron	Sodium edetate	14G03B05309971	1
Fagron	Sodium edetate	14G03-B05-307737	2
Fagron	Sodium edetate	14G03-B05-309971	1
Caelo	Sodium edetate	15035603	1
Caelo	Sodium edetate	15035604	4
Sanacorp	Sodium edetate	1505603	1
Caelo	Sodium edetate	15116602	3
Phoenix	Sodium edetate	15427704	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium edetate	15427704	1
Caelo	Sodium edetate	15427705	1
Fagron	Sodium edetate	15D01-B05-315877	2
Fagron	Sodium edetate	5315A-01925	1
Fagron	Sodium edetate	4114Q-01925	1
Fagron	Sodium edetate	601HA062	4
Phönix	Sodium edetate	11074702	1
Fagron	Sodium edetate	813Q-01925	1
Cranach-Apotheke	Sodium edetate	11a31-no6	1
phönix, 19.12.2012	Sodium edetate	11L13-N02	1
Caelo	Sodium edetate	11074703	1
Caelo	Sodium edetate	11074611	1
Fagron	Sodium edetate	11L13-N02	1
Caelo	Sodium edetate	12181703	3
Caelo	Sodium edetate	12181704	1
Caelo	Sodium edetate	12181706	2
Heidelberger/Noweda	Sodium edetate	12181711	1
Alliance Healthcare	Sodium edetate	12181714	1
Caelo	Sodium edetate	12254507	3
Fagron	Sodium edetate	12E16-N04	2
Sanacorp	Sodium edetate	12G25-N12	2
Fagron	Sodium edetate	12g25-n12	1
Fagron	Sodium edetate	12G25-N12	5
Anzag, 24.10.2012	Sodium edetate	12G25-W12	1
	Sodium edetate	13142009	1
Gehe	Sodium edetate	13E15-N05	1
sanacorp	Sodium edetate	13E15-N05	1
Phönix	Sodium edetate	13E15-N05	3
Sanacorp	Sodium edetate	13E15-N05	1
Fagron	Sodium edetate	13E15-N05	2
Caelo	Sodium edetate	13E15-N05	1
Fagron	Sodium edetate	13G15-N03	3
Sanacorp	Sodium edetate	6/AKD14	1
Caelo	Sodium edetate	3211I-01925	1
Fagron	Sodium edetate	14G03-B05-30773	1
Noweda	Sodium edetate	601H1300	1
Gehe	Sodium edetate	601H1300	1
Fagron	Sodium edetate	601H1300	2
Caelo	Sodium edetate	2913M1925	1
Caesar & Loretz GmbH, 4. . .	Sodium edetate	12181711	1
Fagron	Sodium edetate	12E12-N04	1
Phönix	Sodium edetate	13142004	1
Caesar & Loretz GmbH	Sodium edetate	13142008	1
Fagron	Sodium edetate	13E15-No5	1
Fagron	Sodium edetate	5012Q-01925	1
Caelo	Sodium edetate	92159379	1

- 55 784 spectra from 334 *Apo-Ident* customers from a total of 20 532 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium edetate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Sodium edetate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	240	0	75 638
Type B	0	73	0	81 275
Type C	0	217	0	55 784

The substance/substance group *Sodium edetate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 91.7808 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 97.2350 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20937	20937	0.00	54.36
21362	22915	4.25	54.58
22465	22465	0.00	59.93
22915	22915	0.00	54.38
22926	22915	4.69	52.85
22950	20937	2.84	53.91

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Sodium methyl-4-hydroxybenzoate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	22602-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium methyl-4-hydroxybenzoate; Methylis parahydroxybenzoas natricus; Natrium methylparahydroxybenzoicum

Special notes

When selecting the *Sodium methyl-4-hydroxybenzoate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium methyl-4-hydroxybenzoate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium methyl-4-...	15358708	22602	40	AR-16-FG-015095-01
Caelo	Sodium methyl-4-...	15358709	22776	40	20151127

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Sodium methyl-4-hydroxybenzoate*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Sodium methyl-4-hydroxybenzoate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium methyl-4-hydroxybenzo...	15358708	22603	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Sodium methyl-4-hydroxybenzoate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium methyl-4-hydroxybenzoate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium methyl-4-hydroxybenzoate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	0	0	56 001

The substance/substance group *Sodium methyl-4-hydroxybenzoate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22602	22602	0.00	45.53
22776	22602	11.10	47.97

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium molybdate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20362-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium molybdate dihydrate; Natrii molybdaenicum dihydricum; Natrii molybdate dihydricus

Special notes

When selecting the *Sodium molybdate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium molybdate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium molybdate...	L2809007V-02	20362	40	AR-13-FG-002915-01
Euro OTC	Sodium molybdate...	L1305049-01	21698	30	20130806
Euro OTC	Sodium molybdate...	L1305049-01	21717	40	20130806

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Sodium molybdate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 35 spectra of 2 reference samples from the substance/substance group *Sodium molybdate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium molybdate dihydrate	L1305049-01	21698 [†]	15
Euro OTC	Sodium molybdate dihydrate	L1305049-01	21717 [†]	20

- 81 313 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 1 *Apo-Ident* customers from 3 batches from the substance/substance group *Sodium molybdate dihydrate*.

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium molybdate dihydrate	L1204020-01	1
Euro OTC	Sodium molybdate dihydrate	L1305049-01	2
Euro OTC	Sodium molybdate dihydrate	180910	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*.

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium molybdate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium molybdate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	35	0	81 313
Type C	0	4	0	55 997

The substance/substance group *Sodium molybdate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 82.8571 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20362	20362	0.00	54.75
21698	20362	8.68	50.13
21717	20362	9.82	50.25

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Sodium salicylate, powdered
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	21037-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Sodium salicylate, powdered; Natrii salicylas plv.; Natrii salicylicum plv.

Special notes

When selecting the *Sodium salicylate, powdered* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium salicylate, powdered*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium salicylat...	12158307	21037	40	1403225
Caelo	Sodium salicylat...	13140513	21689	40	20130531
Caelo	Sodium salicylat...	163053	23052	40	20161118*

Validation samples

A total of 213227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Sodium salicylate, powdered*. These samples are listed above in the [calibration samples](#) section.
- 75758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Sodium salicylate, powdered*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sodium salicylate, powdered	10176004	20284	40
Caelo	Sodium salicylate, powdered	13140513	21689 [†]	20
Caelo	Sodium salicylate, powdered	16305301	22879	40

- 81248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Sodium salicylate, powdered*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Sodium salicylate, powdered	102091210	1
Phoenix	Sodium salicylate, powdered	12158309	1
GATT-KOLLER/PHOENIX	Sodium salicylate, powdered	4853/11124512	1
Fagron	Sodium salicylate, powdered	13G08-N07	1
Caelo	Sodium salicylate, powdered	18061305	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium salicylate, powdered* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium salicylate, powdered* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	0	81 248
Type C	0	5	0	55 996

The substance/substance group *Sodium salicylate, powdered* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21037	21037	0.00	78.16
21689	21037	7.32	81.50
23052	23052	0.00	90.81

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sodium tetraborate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20179-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sodium tetraborate; Borax; Natrii tetraboricum

Special notes

When selecting the *Sodium tetraborate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sodium tetraborate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Sodium tetraborate	2905009-02	20179	40	AR-12-FG-002703-01
Caelo	Sodium tetraborate	13290118	21438	40	1412042
Euro OTC	Sodium tetraborate	1404025-01	21656	40	20140514
Euro OTC	Sodium tetraborate	1507024	21854	40	0000010645
Euro OTC	Sodium tetraborate	1510032	22235	40	20151118*
Caelo	Sodium tetraborate	161372	22475	40	20160624*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 240 spectra of 6 reference samples from the substance/substance group *Sodium tetraborate*. These samples are listed above in the [calibration samples](#) section.
- 75 638 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 270 spectra of 10 reference samples from the substance/substance group *Sodium tetraborate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Sodium tetraborate	2905009-02	20179 [†]	10
Caelo	Sodium tetraborate	13290118	21438 [†]	20
Euro OTC	Sodium tetraborate	1404025-01	21656 [†]	20
Euro OTC	Sodium tetraborate	1507024	21854 [†]	20
Euro OTC	Sodium tetraborate	1510032	22235 [†]	20
Caelo	Sodium tetraborate	161372	22475 [†]	20
Euro OTC	Sodium tetraborate	1603043	22508	40
Caelo	Sodium tetraborate	161372	22621	40
Euro OTC	Sodium tetraborate	1607036	22713	40
Euro OTC	Sodium tetraborate	1701046	22990	40

- 81 078 spectra from a total of 1938 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *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 14 *Apo-Ident* customers from 16 batches from the substance/substance group *Sodium tetraborate*.

Supplier	Substance	Batch	Spectra
Caelo	Sodium tetraborate	11369431	1
Caelo	Sodium tetraborate	1309032-01	1
Caelo	Sodium tetraborate	13290118	1
Euro OTC	Sodium tetraborate	1404025-01	4
Caelo	Sodium tetraborate	21051402	1
Caelo	Sodium tetraborate	14310905	2
Productos Quimicos	Sodium tetraborate	16000597	1
Euro OTC	Sodium tetraborate	1402002-01	2
Euro OTC	Sodium tetraborate	1302034-01	1
Euro OTC	Sodium tetraborate	1507024-01	2
Euro OTC	Sodium tetraborate	130203401	1
Euro OTC	Sodium tetraborate	1309032-01	1
Phoenix	Sodium tetraborate	1603043-01	1
Euro OTC	Sodium tetraborate	1408006-01	2
Gatt-Koller / Phoenix	Sodium tetraborate	6187/01142114	1
Fagron	Sodium tetraborate	12H09-N03	1
Euro OTC	Sodium tetraborate	13111207	1

- 55 977 spectra from 335 *Apo-Ident* customers from a total of 20 596 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sodium tetraborate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sodium tetraborate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	235	5	75 638
Type B	0	261	9	81 078
Type C	0	24	0	55 977

The substance/substance group *Sodium tetraborate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	97.9167 % (> 96.6667 %)
Type B	100.0000 % (> 99.9853 %)	96.6667 % (> 95.5556 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 75.0000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20179	20179	0.00	45.54
21438	21438	0.00	45.65
21656	20179	5.74	46.80
21854	21854	0.00	46.36
22235	22235	0.00	45.50
22475	22475	0.00	47.48

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sorbic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20881-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sorbic acid; Acidum sorbicum; Acidum sorbinicum

Special notes

When selecting the *Sorbic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sorbic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sorbic acid	12038025	20881	40	20120315
Caelo	Sorbic acid	13334008	21460	40	AR-15-FG-007849-01
Caelo	Sorbic acid	14176214	22592	40	20140708
Caelo	Sorbic acid	15382002	22826	40	20151112

Validation samples

A total of 213 227 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 *Sorbic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Sorbic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sorbic acid	13334008	21460 [†]	20
Caelo	Sorbic acid	14380714	22593	40
Caelo	Sorbic acid	162080	22616	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 126 spectra from 80 *Apo-Ident* customers from 43 batches from the substance/substance group *Sorbic acid*.

Supplier	Substance	Batch	Spectra
Caelo	Sorbic acid	14176206	6
Caelo	Sorbic acid	13334008	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sorbic acid	14176209	4
Caelo	Sorbic acid	12038025	1
Caelo	Sorbic acid	14176214	4
Caelo	Sorbic acid	12038016	6
Caelo	Sorbic acid	12330618	12
Caelo	Sorbic acid	12330608	7
Caelo	Sorbic acid	4811Q-01048	1
Fagron	Sorbic acid	12330618	1
Caelo	Sorbic acid	12038003	3
Caelo	Sorbic acid	13334003	4
PHOENIX 12.05.2014	Sorbic acid	13334008	1
Caelo	Sorbic acid	13334010	4
Fagron	Sorbic acid	14176206	1
Caelo	Sorbic acid	13334015	1
Caelo	Sorbic acid	14380702	3
Caelo	Sorbic acid	14176212	4
Caelo	Sorbic acid	14380704	1
Caelo	Sorbic acid	14176213	1
Caelo	Sorbic acid	14380714	4
Caelo	Sorbic acid	14380713	2
Caelo	Sorbic acid	14380706	2
Gatt-Koller / Phoenix	Sorbic acid	2575/07142914	1
Caesar & Loretz/Noweda	Sorbic acid	14380706	1
Caelo	Sorbic acid	15382002	1
Caelo	Sorbic acid	213E-01048	1
Caelo	Sorbic acid	15382010	1
Caelo	Sorbic acid	15382007	1
Caelo	Sorbic acid	9280207	1
Finze	Sorbic acid	9280207	1
Caelo	Sorbic acid	10305208	1
Caelo	Sorbic acid	10120303	1
Caelo	Sorbic acid	10305209	1
Caelo	Sorbic acid	10305213	2
Caelo	Sorbic acid	11203806	3
Caelo	Sorbic acid	105505	1
Caelo	Sorbic acid	11203807	11
Phoenix	Sorbic acid	11203813	1
Phönix	Sorbic acid	1171	1
Caelo	Sorbic acid	11203812	1
Caelo	Sorbic acid	12038002	2
Caelo	Sorbic acid	12038009	1
Caelo	Sorbic acid	12038012	1
Sanacorp	Sorbic acid	12038016	1
Anzag	Sorbic acid	12038016	1
Noweda	Sorbic acid	12038016	1
Caelo	Sorbic acid	12038020	6
Noweda	Sorbic acid	12038020	1
Euro OTC	Sorbic acid	12038020	1
Fagron	Sorbic acid	121394	1
Noweda	Sorbic acid	12330608	1
Phönix	Sorbic acid	12330618	1
Sanacorp	Sorbic acid	13334008	1
Caelo	Sorbic acid	29071201	1
Caelo	Sorbic acid	5012E-01048	1

- 55 875 spectra from 335 *Apo-Ident* customers from a total of 20 568 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are docu-

mented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sorbic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sorbic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	100	0	81 248
Type C	0	84	42	55 875

The substance/substance group *Sorbic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	66.6667 % (> 64.2857 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20881	21460	5.16	31.88
21460	21460	0.00	31.41
22592	21460	7.96	32.91
22826	21460	7.65	32.26

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sorbitol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20075-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sorbitol; Sorbitolum

Special notes

When selecting the *Sorbitol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sorbitol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sorbitol	91992409	20075	30	F 2009 000 993
Caelo	Sorbitol	11379309	20499	40	AR-12-FG-011794-01
Caelo	Sorbitol	13278217	21485	40	20130920
Euro OTC	Sorbitol	1506052	21834	40	0000010500
Euro OTC	Sorbitol	1512016	22293	40	20160113*
Euro OTC	Sorbitol	1604007	22539	40	20160428*
Caelo	Sorbitol	16038501	22847	40	20160315
Euro OTC	Sorbitol	1610018	22849	40	20161121*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 8 reference samples from the substance/substance group *Sorbitol*. These samples are listed above in the [calibration samples](#) section.
- 75 568 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 95 spectra of 4 reference samples from the substance/substance group *Sorbitol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sorbitol	91992409	20075 [†]	15
Euro OTC	Sorbitol	1506052	21834 [†]	20
Euro OTC	Sorbitol	1512016	22293 [†]	20
Caelo	Sorbitol	163531	23028	40

- 81 253 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 105 spectra from 35 *Apo-Ident* customers from 75 batches from the substance/substance group *Sorbitol*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Sorbitol	13278216	2
Gehe 01.09.2014	Sorbitol	13278217	1
Caelo	Sorbitol	5021307	1
Fagron	Sorbitol	12J15-N01	1
Fagron	Sorbitol	12L17-N12	3
Caelo	Sorbitol	11379336	2
Fagron	Sorbitol		1
Caelo	Sorbitol	13335307	3
Caelo	Sorbitol	13278241	1
Caelo	Sorbitol	13278249	1
Caelo	Sorbitol	14250807	1
Fagron	Sorbitol	13D08-N27	1
Caelo	Sorbitol	22011305	1
Fagron	Sorbitol	M721140/12L17-N12	1
Caelo	Sorbitol	16101303	1
Caelo	Sorbitol	4091401	1
Phönix 05.11.2012	Sorbitol	1112010-01	1
Caelo	Sorbitol	8081402	1
Phönix Gotha	Sorbitol	10383330	1
Caelo	Sorbitol	11379320	1
Phönix Gotha	Sorbitol	11379332	1
Caelo	Sorbitol	11379322	1
Caelo	Sorbitol	11379321	1
Fagron	Sorbitol	11I09-N11	1
Caelo	Sorbitol	11379337	2
Caelo	Sorbitol	12249108	2
Phoenix 12.08.2013	Sorbitol	12249108	1
Caelo	Sorbitol	12249109	2
Caelo	Sorbitol	12249110	4
Caelo	Sorbitol	12249126	1
Caelo	Sorbitol	12249124	1
Caelo	Sorbitol	12249139	1
Caelo	Sorbitol	12249140	1
Caelo	Sorbitol		1
Caelo	Sorbitol	12345	1
Fagron	Sorbitol	12E30-N24	5
Caelo	Sorbitol	12L07-N12	1
Euro OTC	Sorbitol	1301019-01	2
Caelo	Sorbitol	13278204	1
Caelo	Sorbitol	13278239	1
Caelo	Sorbitol	13278206	1
Caelo	Sorbitol	13335307	1
Caelo	Sorbitol	13278246	2
Caelo	Sorbitol	13278247	1
GEHE 28.11.2014	Sorbitol	13278245	1
Caelo	Sorbitol	13278218	1
Caelo	Sorbitol	13335304	1
Merck	Sorbitol	13D08-N27	1
Fagron	Sorbitol	13E07-B40	2
Fagron	Sorbitol	13G04-N04	1
Gehe	Sorbitol	1404007-01	1
Euro OTC	Sorbitol	1404007-01	3
Caelo	Sorbitol	14250808	1
Fagron	Sorbitol	14E21-B02	1
Euro OTC	Sorbitol	1512016-01	1
Euro OTC	Sorbitol	1506052-01	1
Caelo	Sorbitol	15118902	2
Caelo	Sorbitol	15012708	1
Euro OTC	Sorbitol	1501048-01	1
Caelo	Sorbitol	15208302	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sorbitol	15208303	1
Caelo	Sorbitol	15208306	1
Caelo	Sorbitol	15208309	2
Caelo	Sorbitol	16038503	1
Caelo	Sorbitol	15208311	2
Caelo	Sorbitol	17011305	1
Gatt-Koller / Phoenix	Sorbitol	1718/0513	1
Gatt-Koller / Phoenix	Sorbitol	1718/05134013	1
Caelo	Sorbitol	20021501	1
Caelo	Sorbitol	23071201	1
Caelo	Sorbitol	23081401	1
Caelo	Sorbitol	26071402	1
EuRho/Anzag	Sorbitol	4712I-02298	1
Euro OTC	Sorbitol	700476	1
Caelo	Sorbitol	13335302	1
Caelo	Sorbitol	15118901	1
Caelo	Sorbitol	11379332	2
Euro OTC	Sorbitol	1406014-01	1
Euro OTC	Sorbitol	150652-01	1
Caelo	Sorbitol	10383323	1

- 55 896 spectra from 335 *Apo-Ident* customers from a total of 20 539 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sorbitol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sorbitol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	75 568
Type B	0	95	0	81 253
Type C	0	100	5	55 896

The substance/substance group *Sorbitol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 93.6842 %)
Type C	100.0000 % (> 99.8622 %)	95.2381 % (> 92.3810 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.
Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20075	20075	0.00	32.40
20499	20499	0.00	33.33
21485	20499	2.29	35.06
21834	21834	0.00	34.55
22293	22293	0.00	34.59
22539	22539	0.00	33.93
22847	21834	3.63	34.91
22849	22849	0.00	33.31

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Soy lecithin (instant form)**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20539-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Soy lecithin (instant form); Lecithinum e sojæ plv.

Special notes

When selecting the *Soy lecithin (instant form)* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Soy lecithin (instant form)*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Soy lecithin (in...	11371501	20539	40	20120105
Caelo	Soy lecithin (in...	13030504	20985	40	1404399
Caelo	Soy lecithin (in...	13279813	21523	40	20130903

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Soy lecithin (instant form)*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Soy lecithin (instant form)*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Soy lecithin (instant form)	11145311	20448	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 32 spectra from 17 *Apo-Ident* customers from 22 batches from the substance/substance group *Soy lecithin (instant form)*.

Supplier	Substance	Batch	Spectra
Caelo	Soy lecithin (instant form)	13279806	1
Caelo	Soy lecithin (instant form)	12139012	1
Caelo	Soy lecithin (instant form)	14281605	1
Caelo	Soy lecithin (instant form)	13030506	1
Caelo	Soy lecithin (instant form)	11371502	1
Caelo	Soy lecithin (instant form)	11145311	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Soy lecithin (instant form)	14281620	1
Caesar & Loretz GmbH	Soy lecithin (instant form)	13279813	1
Sanacorp	Soy lecithin (instant form)	14196305	1
Caelo	Soy lecithin (instant form)	14196305	1
Caelo	Soy lecithin (instant form)	14281618	4
Caesar & Loretz GmbH	Soy lecithin (instant form)	14281603	1
Caelo	Soy lecithin (instant form)	15262701	2
siehe WE-Prüfprotokoll	Soy lecithin (instant form)	31/14	1
Caelo	Soy lecithin (instant form)	11371504	1
Caelo	Soy lecithin (instant form)	12139001	4
Caelo	Soy lecithin (instant form)	12139011	1
Caelo	Soy lecithin (instant form)		1
Caesar & Loretz GmbH, 4...	Soy lecithin (instant form)	12139013	1
Caelo	Soy lecithin (instant form)	12139002	1
Caesar & Loretz GmbH	Soy lecithin (instant form)	13030503	1
Caelo	Soy lecithin (instant form)	12139008	1
Caelo	Soy lecithin (instant form)	13030503	1
Caelo	Soy lecithin (instant form)	12139013	1
Caelo	Soy lecithin (instant form)	13279804	1

- 55 969 spectra from 335 *Apo-Ident* customers from a total of 20 590 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Soy lecithin (instant form)* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Soy lecithin (instant form)* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	20	20	81 308
Type C	0	30	2	55 969

The substance/substance group *Soy lecithin (instant form)* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	50.0000 % (> 42.5000 %)
Type C	100.0000 % (> 99.8622 %)	93.7500 % (> 84.3750 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20539	20985	7.40	50.01
20985	20985	0.00	47.68
21523	20985	12.24	53.32

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Spironolactone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21032-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Spironolactone; Spironolactonum

Special notes

When selecting the *Spironolactone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Spironolactone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Spironolactone	1212034-01	21032	42	1403151
Euro OTC	Spironolactone	1212034-01	21076	40	20130215
Euro OTC	Spironolactone	1602006	22369	30	20160309*
Caelo	Spironolactone	14378715	22385	40	20150211
Fagron	Spironolactone	2294216E20-B06-322016	22942	40	20160531

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 192 spectra of 5 reference samples from the substance/substance group *Spironolactone*. These samples are listed above in the [calibration samples](#) section.
- 75 686 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 245 spectra of 6 reference samples from the substance/substance group *Spironolactone*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Spironolactone	1004035-01	20180	50
Euro OTC	Spironolactone	1602006	22369 [†]	15
Fagron	Spironolactone	15G22-B10-311159	22386	40
Caelo	Spironolactone	160773	22444	60
Euro OTC	Spironolactone	1612002	22909	40
Caelo	Spironolactone	16077305	22954	40

- 81 103 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 135 spectra from 55 *Apo-Ident* customers from 67 batches from the substance/substance group *Spironolactone*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Spironolactone	10H24-N10	2
Caelo	Spironolactone	12049130	2
Gutenberg-Apotheke	Spironolactone	12049130	2
Sanacorp	Spironolactone	1212034-01	1
Euro OTC	Spironolactone	1212034-01	4
Caelo	Spironolactone	13124303	7
Caelo	Spironolactone	13124304	4
Gutenberg-Apotheke	Spironolactone	13124304	2
Caelo	Spironolactone	13124309	5
Caelo	Spironolactone	13124314	2
Caelo	Spironolactone	13124315	6
Sanacorp/Phoenix	Spironolactone	13124315	3
Caelo	Spironolactone	13124317	4
Caelo	Spironolactone	13124321	2
Fagron	Spironolactone	13G03-N09	1
Fagron	Spironolactone		1
Caelo	Spironolactone	13190309	1
Caelo	Spironolactone	1314309	1
Fagron	Spironolactone	13G16-B08-288051	1
Fagron	Spironolactone	13G16-B08	1
Caelo	Spironolactone	1437807	1
Euro OTC	Spironolactone	1402029-01	1
Caelo	Spironolactone	14378702	2
Caelo	Spironolactone	140202901	1
Noweda	Spironolactone	14378702	1
Caelo	Spironolactone	14378709	2
Caelo	Spironolactone	14378707	1
Caelo	Spironolactone	14378710	2
Noweda	Spironolactone	14378710	1
Jenne	Spironolactone	14378715	1
Caelo	Spironolactone	14378717	1
Stumpf	Spironolactone	14378718	1
Caelo	Spironolactone	14378715	1
Fagron	Spironolactone	14B20-B06-294618	4
Fagron	Spironolactone	14B20B06294618	1
Fagron	Spironolactone	14J02-B02-303621	4
Caelo	Spironolactone	150401601	1
Fagron	Spironolactone	14J02-B303621	1
Euro OTC	Spironolactone	1504016-01	1
Caelo	Spironolactone	16077302	1
Caelo	Spironolactone	16077303	2
Fagron	Spironolactone	2415E-03249	1
Caelo	Spironolactone	5013Q-03249	1
Fagron	Spironolactone	ELN151105-2	1
Euro OTC	Spironolactone	1004035-01	1
Fagron	Spironolactone	80616-7	1
Euro OTC	Spironolactone	1004035	1
Euro OTC	Spironolactone	1101013-01	1
Caelo	Spironolactone	10159914	1
Noweda	Spironolactone	1101013-0	1
Phönix	Spironolactone	1101013-03	1
EuRho	Spironolactone	1101013-01	1
Caelo	Spironolactone	11042602	1
Caesar&lorenz,Phoenix	Spironolactone	11042603	1
ANZAG am 10.05.2012	Spironolactone	11042607	1
Caelo	Spironolactone	11042607	1
Fagron	Spironolactone	12/17-n01	1
Caesar&lorenz,Phoenix	Spironolactone	11042613	1
Caelo	Spironolactone	11G28-N03	1
Sanacorp	Spironolactone	11042612	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Spironolactone	12/17-N01	1
Alliance Healthcare	Spironolactone	12049103	2
Gehe	Spironolactone	12049105	1
Caelo	Spironolactone	12049105	2
Caelo	Spironolactone	12049109	1
Phönix	Spironolactone	12049109	1
Caelo	Spironolactone	12049118	4
Caelo	Spironolactone	12049110	2
Alliance Healthcare	Spironolactone	12049119	1
Caelo	Spironolactone	12049123	4
Caesar & Loretz GmbH	Spironolactone	12049129	1
Alliance Healthcare	Spironolactone	12049129	1
Caelo	Spironolactone	12049129	1
Sanacorp	Spironolactone	12049130	1
Fagron	Spironolactone	12I17-N01	1
Fagron	Spironolactone	13D12-N08	1
Gehe	Spironolactone	13D12-N08	1
Fagron	Spironolactone	16A14-B05-317123	1
Caesar&lorenz,Anzag	Spironolactone	13124309	1
Caelo	Spironolactone	2013U-03249	1
Noweda	Spironolactone	11B07-N06	2
Euro OTC	Spironolactone	3513E-03249	1
Fagron	Spironolactone	12J15-N04	1

- 55 866 spectra from 335 *Apo-Ident* customers from a total of 20 544 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Spironolactone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spironolactone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	192	0	75 686
Type B	0	225	20	81 103
Type C	0	128	7	55 866

The substance/substance group *Spironolactone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8750 %)
Type B	100.0000 % (> 99.9853 %)	91.8367 % (> 90.6122 %)
Type C	100.0000 % (> 99.8622 %)	94.8148 % (> 92.5926 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21032	21032	0.00	41.34
21076	21032	4.09	44.47
22369	22369	0.00	41.26
22385	22369	21.18	39.82
22942	21032	4.01	42.90

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Spray-dried arabic gum**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20457-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Spray-dried arabic gum; Acaciae gummi dispersione desiccatum; Gummi arabicum dispersione desiccatum

Special notes

When selecting the *Spray-dried arabic gum* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Spray-dried arabic gum*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Spray-dried arab...	11345708	20457	40	AR-13-FG-002496-01
Caelo	Spray-dried arab...	14141901	21431	80	AR-15-FG-006809-01
Caelo	Spray-dried arab...	15413201	22653	40	AR-17-FG-000844-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 3 reference samples from the substance/substance group *Spray-dried arabic gum*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Spray-dried arabic gum*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Spray-dried arabic gum	14141901	21431 [†]	40
Caelo	Spray-dried arabic gum	162331	22853	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 *Apo-Ident* customers from 7 batches from the substance/substance group *Spray-dried arabic gum*.

Supplier	Substance	Batch	Spectra
Caelo	Spray-dried arabic gum	15086704	1
Caelo	Spray-dried arabic gum	11345715	1
Caelo	Spray-dried arabic gum	12138607	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
Caelo	Spray-dried arabic gum	12111301	1
Caelo	Spray-dried arabic gum	12372302	1
Caelo	Spray-dried arabic gum	15413201	1
Caelo	Spray-dried arabic gum	12138612	1

- 55 993 spectra from 335 *Apo-Ident* customers from a total of 20 604 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Spray-dried arabic gum* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Spray-dried arabic gum* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	80	0	81 268
Type C	0	8	0	55 993

The substance/substance group *Spray-dried arabic gum* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20457	20457	0.00	16.33
21431	21431	0.00	11.61
22653	22653	0.00	11.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Starch**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20038-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Starch; Amylum Maydis; Amylum oryzae; Amylum Solani; Amylum tritici; Corn starch; Maydis amyllum; Oryzae amyllum; Potato starch; Rice starch; Solani amyllum; Tritici amyllum; Wheat starch

Special notes

When selecting the *Starch* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Starch*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Rice starch	09F02-N03	20038	60	I 2009 000 344
Caelo	Corn starch	91955439	20181	40	AR-12-FG-002851-01
Fagron	Wheat starch	10015905	20199	40	AR-12-FG-002706-01
Caelo	Potato starch	09352108	20244	50	P143-11
Caelo	Rice starch	12068525	20790	40	20120327

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Potato starch	12360213	20996	40	1403494
Caelo	Wheat starch	14023203	21447	40	AR-16-FG-011433-01
Caelo	Corn starch	13154914	21827	40	20130529
Caelo	Potato starch	14033815	21965	40	20140207
Klenk	Wheat starch	0104A141114	21973	40	20141210
Caelo	Wheat starch	15124707	22246	40	20150527
Caelo	Potato starch	161237	22449	40	20160621*
Caelo	Corn starch	161385	22450	40	20160621*
Caelo	Rice starch	16144501	22585	40	20160504

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 590 spectra of 14 reference samples from the substance/substance group *Starch*. These samples are listed above in the [calibration samples](#) section.
- 75 288 spectra from a total of 1562 batches from further 380 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 206 spectra of 10 reference samples from the substance/substance group *Starch*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Rice starch	9F02-N03	20038 [†]	16
Caelo	Corn starch	91955439	20181 [†]	10
Caelo	Wheat starch	14023203	21447 [†]	20
Caelo	Corn starch	13154914	21827 [†]	20
Caelo	Potato starch	14033815	21965 [†]	20
Klenk	Wheat starch	104A141114	21973 [†]	20
Caelo	Wheat starch	15124707	22246 [†]	20
Caelo	Potato starch	161237	22449 [†]	20
Caelo	Corn starch	161385	22450 [†]	20
Caelo	Rice starch	162180	22642	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 81 142 spectra from a total of 1937 batches from further 617 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 146 spectra from 82 *Apo-Ident* customers from 67 batches from the substance/substance group *Starch*.

Supplier	Substance	Batch	Spectra
Klenk	Rice starch	64A130304	10
Caelo	Rice starch	12238704	1
Gutenberg-Apotheke	Rice starch	12360216	1
Caelo	Rice starch	P134/14	1
Klenk	Corn starch	64A080218	6
Caelo	Corn starch	12238705	2
Caelo	Corn starch	12238715	3
Caelo	Corn starch	1179307	1
Caelo	Corn starch	11179315	2
Klenk	Wheat starch	104A120621	2
Caelo	Potato starch	11301012	2
Klenk	Potato starch	94A110512	1
Bombastus	Potato starch	12214303	2
Klenk	Potato starch	94A130304	1
Caelo	Corn starch	64A130304	2
Klenk	Corn starch	64A130304	10
Caelo	Corn starch	15119011	4
Caelo	Corn starch	10061146	1
Caelo	Corn starch	11179307	1
Caelo	Corn starch	13154904	1
Caelo	Corn starch	15310902	1
Caelo	Corn starch	15310914	2
Caelo	Corn starch	15310903	1
GEHE	Corn starch	64A080218	2
Klenk	Rice starch	84A141114	1
Caelo	Rice starch	15118607	1
Caelo	Rice starch	10177507	1
Caelo	Rice starch	11186027	1
Caelo	Rice starch	10177515	1
Klenk	Rice starch	64A080218	2
Klenk	Rice starch	104A120621	4
Caelo	Rice starch	11186026	2
Caelo	Rice starch	12166007	2
Caelo	Rice starch	12238714	2
Caelo	Rice starch	12238719	1
Caelo	Rice starch	13005905	2
Caelo	Rice starch	13154904	3
Caelo	Rice starch	200613K3	1
Klenk	Rice starch	84A130304	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Rice starch	64A130304	1
Klenk	Rice starch	104A130304	5
Caelo	Rice starch	12068520	1
Caelo	Rice starch	13005908	1
Caelo	Rice starch	13089507	1
Caelo	Rice starch	13305103	2
Caelo	Rice starch	13305103	1
Caelo	Rice starch	14011612	2
Caelo	Rice starch	14011621	1
Noweda	Rice starch	14011621	1
Caelo	Rice starch	13305108	1
Caelo	Rice starch	14011630	2
Noweda	Rice starch	14023203	1
Caelo	Rice starch	14023203	3
Caelo	Rice starch	14025710	1
Caelo	Rice starch	15119001	1
Caelo	Rice starch	2212M-01115	1
Caelo	Rice starch	16101401	1
Klenk	Rice starch	94A100122	1
Klenk	Rice starch	94A120621	1
Caelo	Rice starch	104A120621	1
Caelo	Rice starch	9352108	1
Caelo	Rice starch	10061134	2
Caelo	Rice starch	11132406	1
Caelo	Rice starch	12214303	1
Fagron	Rice starch	12L19-N06	1
Caelo	Rice starch	13154914	1
Nachprüfung	Rice starch	3709E01116	1
Koisser	Rice starch	WE07032013	1
Klenk	Wheat starch	104a141114	1
Klenk	Wheat starch	104A141114	3
Caelo	Wheat starch	15124707	1
Caelo	Wheat starch	1512477	1
Caelo	Wheat starch	104A141114	1
Klenk	Wheat starch	104A160512	1
Klenk	Wheat starch	104A101116	1
Anzag 17.04.13 ek: 9,65EUR	Wheat starch	104A120621	2
Klenk	Wheat starch	10A160512	1
Caelo	Wheat starch	10015911	1
Caelo	Wheat starch	11146011	1
Caelo	Wheat starch	11350907	3
Caelo	Wheat starch	11350911	4
Fiebig 16.01.13 ek: 4,18EUR	Wheat starch	11350911	1

- 55 855 spectra from 335 *Apo-Ident* customers from a total of 20 546 batches from a further 680 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Starch* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Starch* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down

the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	590	0	75 288
Type B	0	206	0	81 142
Type C	0	145	1	55 855

The substance/substance group *Starch* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.9831 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.0874 %)
Type C	100.0000 % (> 99.8622 %)	99.3151 % (> 97.2603 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20038	20038	0.00	12.29
20181	20181	0.00	14.15
20199	20199	0.00	16.23
20244	20244	0.00	35.23
20790	20038	5.55	12.20
20996	20996	0.00	43.00
21447	21447	0.00	16.45
21827	21447	5.39	14.06
21965	20996	5.89	40.76
21973	21447	3.58	17.89
22246	20038	5.37	16.27
22449	22449	0.00	41.03
22450	22450	0.00	18.70
22585	22450	5.52	17.44

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Stearic acid 50**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20869-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Stearic acid 50; Acidum stearicum; Acidum stearinicum

Special notes

When selecting the *Stearic acid 50* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Stearic acid 50*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Stearic acid 50	12241910	20869	40	AR-15-FG-007284-01
Caelo	Stearic acid 50	14359310	21793	40	20150126
Caelo	Stearic acid 50	14359310	21928	40	AR-16-FG-004044-01
Caelo	Stearic acid 50	14359314	22274	40	20150126

Validation samples

A total of 213 227 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 *Stearic acid 50*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Stearic acid 50*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Stearic acid 50	14359310	21793 [†]	20
Caelo	Stearic acid 50	14359310	21928 [†]	20
Caelo	Stearic acid 50	14359314	22274 [†]	20
Caelo	Stearic acid 50	163469	23032	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 14 *Apo-Ident* customers from 12 batches from the substance/substance group *Stearic acid 50*.

Supplier	Substance	Batch	Spectra
Caelo	Stearic acid 50	12241915	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
Caelo	Stearic acid 50	10176203	1
Phoenix	Stearic acid 50	12241915	1
Caelo	Stearic acid 50	1224	1
Caelo	Stearic acid 50	12241914	1
Caelo	Stearic acid 50	12241930	2
Caesar & Loretz	Stearic acid 50	14359310	1
Phönix	Stearic acid 50	1224915	1
Caelo	Stearic acid 50	14359314	1
Caelo	Stearic acid 50	11103706	1
Caelo	Stearic acid 50	11308505	1
Caesar&Loretz GmbH/Anzag	Stearic acid 50	11308505	1
Caelo	Stearic acid 50	11308514	2
Caelo	Stearic acid 50	12241911	1

- 55 982 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Stearic acid 50* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Stearic acid 50* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	100	0	81 248
Type C	0	19	0	55 982

The substance/substance group *Stearic acid 50* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20869	20869	0.00	63.17
21793	21928	2.32	61.53
21928	21928	0.00	61.44
22274	20869	4.30	60.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sucrose**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20372-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sucrose; Saccharum

Special notes

When selecting the *Sucrose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sucrose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sucrose	1901208731	20372	40	AR-12-FG-010950-01
Caelo	Sucrose	13352909	21484	40	1410501
Caelo	Sucrose	14340003	21736	40	20141114
Caelo	Sucrose	163286	23057	40	20161219*

Validation samples

A total of 213 227 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 *Sucrose*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 220 spectra of 6 reference samples from the substance/substance group *Sucrose*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Sucrose	11B02-N12	20216	40
Caelo	Sucrose	12146801	20909	40
Caelo	Sucrose	14340003	21736 [†]	20
Caelo	Sucrose	161999	22615	40
Caelo	Sucrose	162060	22643	40
Caelo	Sucrose	163081	23058	40

- 81 128 spectra from a total of 1941 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 224 spectra from 74 *Apo-Ident* customers from 123 batches from the substance/substance group *Sucrose*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Werner	Sucrose	1901208731	2
Caelo	Sucrose		2
pharm-a-speres	Sucrose	8731003	1
Caelo	Sucrose	11246306	1
Phönix 13.05.2013	Sucrose	1256433	1
Caelo	Sucrose	12241803	2
Caelo	Sucrose	13031405	5
Caelo	Sucrose	13031409	3
Caelo	Sucrose	13352902	12
Caelo	Sucrose	14197302	4
Penny	Sucrose	L12513800	3
Caelo	Sucrose	15028802	3
Soldan	Sucrose	232027	1
Fagron	Sucrose	1011208731	2
Noweda	Sucrose	10179620	1
Fagron	Sucrose	11/16-N01	1
Fagron	Sucrose	11/16-N01	1
Caelo	Sucrose	11246307	1
Caelo	Sucrose	11246313	2
Fagron	Sucrose	11B02-N12	1
Fagron	Sucrose	11E19-N04	1
Fagron	Sucrose	11L09-N16	2
Fagron	Sucrose	11I16-N01	1
Caelo	Sucrose	12107805	1
Caelo	Sucrose	12107806	1
Noweda	Sucrose	12241801	1
Caelo	Sucrose	12241804	4
Caelo	Sucrose	12241801	1
Noweda	Sucrose	12241803	1
Caelo	Sucrose	12241808	5
Euro OTC	Sucrose	12241808	1
Caelo	Sucrose	12241816	2
Caelo	Sucrose	12241817	3
Caelo	Sucrose	12280309	1
Haushalt	Sucrose	123456	1
Fagron	Sucrose	12-E03-M01	1
Fagron	Sucrose	130100R	1
Fagron	Sucrose	12E29-N04	1
Caelo	Sucrose	130031417	1
Caelo	Sucrose	13031406	2
Caelo	Sucrose	13031410	4
Caelo	Sucrose	13031414	3
Caelo	Sucrose	13031417	2
Caelo	Sucrose	13352901	3
Caelo	Sucrose	13352905	1
Caelo	Sucrose	13352908	1
Caelo	Sucrose	13352909	4
Infectopharm/Phoenix	Sucrose	13352909	1
Caelo	Sucrose	13352916	3
Caelo	Sucrose	13352911	1
Caelo	Sucrose	13352920	4
Caelo	Sucrose	1352920	1
Fagron	Sucrose	13A07-N03	1
Fagron	Sucrose	13D29-N08	1
Fagron	Sucrose	13G03-N16	1
Fagron	Sucrose	13J11-N01	1
Fagron	Sucrose	13I30-N05	1
Caelo	Sucrose	14197301	2
Fagron	Sucrose	13K18-B33-288225	1
Caelo	Sucrose	14197313	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sucrose	14340003	2
Caelo	Sucrose	14340004	3
Caelo	Sucrose	14340005	1
Caelo	Sucrose	14340006	1
Caelo	Sucrose	14340008	2
Caelo	Sucrose	14340009	1
Caelo	Sucrose	15028801	8
Caelo	Sucrose	15156008	1
Caelo	Sucrose	15182804	7
Jenne	Sucrose	15182804	1
Caelo	Sucrose	15182805	1
AHD	Sucrose	15182805	1
Caelo	Sucrose	15446002	4
Phönix	Sucrose	15446002	1
Fagron	Sucrose	15446002	1
Caelo	Sucrose	15446007	1
Caelo	Sucrose	15446003	1
Caelo	Sucrose	16049907	2
Caelo	Sucrose	20011401	1
Caelo	Sucrose	20031515	1
Penny Markt	Sucrose	201L113530100	3
Fagron	Sucrose	2102308731	1
Caelo	Sucrose	23121-02207	1
Caelo	Sucrose	24061502	1
Caelo	Sucrose	28041504	1
Caelo	Sucrose	28081308	1
Caelo	Sucrose	29081502	1
Sanacorp	Sucrose	AKD5	1
Fagron	Sucrose	5112I-02207	1
Pfeifer/Langen	Sucrose	L03144N	1
Penny Markt	Sucrose	L120325600	2
Penny Markt	Sucrose	L120404100	3
Penny Markt	Sucrose	L120628000	3
Fagron	Sucrose	5071201	1
Kaufland	Sucrose	L24494	2
Fagron	Sucrose	11/20-N05	1
Kaufland	Sucrose	L24475	1
Spagyra	Sucrose	12091120645	1
Spagyra	Sucrose	12082320717	1
Spagyra	Sucrose	12103020975	1
Spagyra	Sucrose	1210222892	1
Fagron	Sucrose	12G26-N01	3
Spagyra	Sucrose	13012920302	1
Spagyra	Sucrose	13020620240	1
Spagyra	Sucrose	13030621373	1
Spagyra	Sucrose	13040921424	1
Spagyra	Sucrose	13040921427	1
Spagyra	Sucrose	13040921430	1
Spagyra	Sucrose	13040921431	1
Spagyra	Sucrose	13050621773	2
Spagyra	Sucrose	13041920152	1
Spagyra	Sucrose	13041920154	1
Spagyra	Sucrose	13051520939	1
Spagyra	Sucrose	13061020524	1
Spagyra	Sucrose	13051520941	1
Spagyra	Sucrose	13061020525	1
Spagyra	Sucrose	13061220385	1
Spagyra	Sucrose	13061020529	1
Spagyra	Sucrose	13061020528	1
Spagyra	Sucrose	13061020526	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Sucrose	13G04-N01	1
Spagyra	Sucrose	13072620834	1
Staufen-Pharma	Sucrose	161112	2
Spagyra	Sucrose	13070420937	1
Spagyra	Sucrose	13070420936	1
Gehe 02.07.2013	Sucrose	1911208731	1
Caelo	Sucrose	13063907	1
Spagyra	Sucrose	13070420938	1
Soldan	Sucrose	243983	1
Soldan	Sucrose		1
Penny Markt	Sucrose	L120612100	3

- 55 777 spectra from 335 *Apo-Ident* customers from a total of 20 491 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sucrose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sucrose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	176	44	81 128
Type C	0	199	25	55 777

The substance/substance group *Sucrose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	80.0000 % (> 78.6364 %)
Type C	100.0000 % (> 99.8622 %)	88.8393 % (> 87.5000 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20372	20372	0.00	47.54
21484	21484	0.00	47.05
21736	21484	1.92	47.19
23057	23057	0.00	47.88

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sulfacetamide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20695-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sulfacetamide; Sulfacetamidum

Special notes

When selecting the *Sulfacetamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sulfacetamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfacetamide	11085910	20695	40	1402651
Euro OTC	Sulfacetamide	1312012-01	21633	40	20140117
Euro OTC	Sulfacetamide	1509018	21902	40	20150929*

Validation samples

A total of 213 227 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 *Sulfacetamide*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 80 spectra of 3 reference samples from the substance/substance group *Sulfacetamide*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfacetamide	10145802	20140	40
Euro OTC	Sulfacetamide	1312012-01	21633 [†]	20
Euro OTC	Sulfacetamide	1509018	21902 [†]	20

- 81 268 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 44 spectra from 19 *Apo-Ident* customers from 15 batches from the substance/substance group *Sulfacetamide*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Sulfacetamide	1312012-01	4
Gehe	Sulfacetamide	1312012-01	2
Euro OTC	Sulfacetamide	1312012-02	2
EuRho/Phönix	Sulfacetamide	131201202	1
Phönix Gotha	Sulfacetamide	1312012-02	1
Euro OTC	Sulfacetamide	1509018-01	4
Industrias GmbH / Ph	Sulfacetamide	64518	1
Caelo	Sulfacetamide	10145802	1
Phönix Gotha	Sulfacetamide	10145811	2
Caelo	Sulfacetamide	10145811	1
Klenk	Sulfacetamide	11085904	1
Phoenix am 15.06.2012	Sulfacetamide	11085904	1
Gehe	Sulfacetamide	11085904	1
Caelo	Sulfacetamide	11085909	1
Caelo	Sulfacetamide	11085911	3
Phönix Gotha	Sulfacetamide	11085909	1
Phönix	Sulfacetamide	11085910	1
Phönix Gotha	Sulfacetamide	11085911	1
Caelo	Sulfacetamide	11085912	1
AHC 12.08.13 EK9,31	Sulfacetamide	11085912	1
Caelo	Sulfacetamide	11085914	2
Gehe	Sulfacetamide	1112032-01	5
Euro OTC	Sulfacetamide	1112032-01	2
Phoenix	Sulfacetamide	1112032-02	2
Euro OTC	Sulfacetamide	1112032-02	2

- 55 957 spectra from 335 *Apo-Ident* customers from a total of 20 596 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sulfacetamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sulfacetamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	70	10	81 268
Type C	0	39	5	55 957

The substance/substance group *Sulfacetamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	87.5000 % (> 83.7500 %)
Type C	100.0000 % (> 99.8622 %)	88.6364 % (> 81.8182 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several

new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20695	20695	0.00	56.69
21633	21902	4.86	54.56
21902	21902	0.00	47.80

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sulfadiazine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20753-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sulfadiazine; Sulfadiazinum

Special notes

When selecting the *Sulfadiazine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sulfadiazine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfadiazine	12164101	20753	40	1402053
Caelo	Sulfadiazine	13150011	21744	40	20130708

Validation samples

A total of 213 227 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 *Sulfadiazine*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Sulfadiazine*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfadiazine	13150011	21744 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Sulfadiazine*.

Supplier	Substance	Batch	Spectra
Caelo	Sulfadiazine	11194204	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sulfadiazine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sulfadiazine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	1	0	56 000

The substance/substance group *Sulfadiazine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20753	20753	0.00	86.47
21744	20753	2.23	86.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Sulfogaiacol hydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20327-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Sulfogaiacol hydrate; Kalii sulfuajacolicum; Sulfoguaiacolum hydricum

Special notes

When selecting the *Sulfogaiacol hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Sulfogaiacol hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sulfogaiacol hyd...	10353605	20327	40	AR-13-FG-001235-01
Caelo	Sulfogaiacol hyd...	13405805	21696	30	20140108
Gatt-Koller	Sulfogaiacol hyd...	1156/04152115	21843	40	20150410

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Sulfogaiacol hydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 47 spectra of 3 reference samples from the substance/substance group *Sulfogaiacol hydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Sulfogaiacol hydrate	13405805	21696 [†]	15
Gatt-Koller	Sulfogaiacol hydrate	1156/04152115	21843 [†]	20
Caelo	Sulfogaiacol hydrate	15343912	not required	12

- 81 301 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Sulfogaiacol hydrate*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Sulfogaiacol hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Sulfogaiacol hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	47	0	81 301
Type C	0	0	0	56 001

The substance/substance group *Sulfogaiacol hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 87.2340 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20327	20327	0.00	78.41
21696	20327	22.07	76.37
21843	20327	12.96	77.20

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **SyrSpend[®] SF / pH4**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 22494-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

SyrSpend[®] SF / pH4; SyrSpend[®] SF Alka; SyrSpend[®] SF pH4

Special notes

When selecting the *SyrSpend[®] SF / pH4* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *SyrSpend[®] SF / pH4*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	SyrSpend [®] SF Alka	15H11-B04-311722	22494	40	1608351
Fagron	SyrSpend [®] SF pH4	15A26-B04-311720	22496	40	1608352
Fagron	SyrSpend [®] SF Alka	15H11-B04-311722	22718	40	1701054
Fagron	SyrSpend [®] SF pH4	15A26-B04-305667	22719	40	1701055

Validation samples

A total of 213 227 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 *SyrSpend[®] SF / pH4*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 382 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *SyrSpend[®] SF / pH4*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	SyrSpend [®] SF Alka	15H11-B04-311722	22495	40
Fagron	SyrSpend [®] SF pH4	15A26-B04-311720	22497	40

- 81 268 spectra from a total of 1945 batches from further 619 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *SyrSpend[®] SF / pH4*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *SyrSpend*[®] *SF* / *pH4* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *SyrSpend*[®] *SF* / *pH4* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	80	0	81 268
Type C	0	0	0	56 001

The substance/substance group *SyrSpend*[®] *SF* / *pH4* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
22494	22494	0.00	27.14
22496	22496	0.00	19.52
22718	22718	0.00	18.10
22719	22719	0.00	11.16

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tannin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20018-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tannin; Acidum tannicum; Tanninum

Special notes

When selecting the *Tannin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tannin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tannin	81318508	20018	80	I 2009 000 302
Caelo	Tannin	12336016	21608	40	20121127
Fagron	Tannin	13H30-B03-287645	21653	40	20131011

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 3 reference samples from the substance/substance group *Tannin*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Tannin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tannin	12336016	21608 [†]	20
Fagron	Tannin	13H30-B03-287645	21653 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 188 spectra from 111 *Apo-Ident* customers from 72 batches from the substance/substance group *Tannin*.

Supplier	Substance	Batch	Spectra
Caelo	Tannin	12336011	4
Caelo	Tannin	14031913	3
Fagron	Tannin	12H14N05	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Tannin	11302307	7
Caelo	Tannin	12171101	7
Fagron	Tannin	12H14-N05	4
Caelo	Tannin	11302306	1
Fagron	Tannin	2212M-01052	1
A.H.D.	Tannin	13E27-N08	1
Caelo	Tannin	2211Q-01052	1
Caelo	Tannin	12336016	8
Caelo	Tannin	9128601	1
Sanacorp	Tannin		1
Caelo	Tannin	12171106	9
Caelo	Tannin	12336009	10
Hirsch	Tannin	1811209	1
Caelo	Tannin	10315107	3
Fagron	Tannin	1014A-01052	1
Caelo	Tannin	10019007	2
Phönix	Tannin	10313107Retest	1
Caelo	Tannin	10315110	2
Phönix	Tannin	10315110	1
Noweda	Tannin	11G01-N08	1
Fagron	Tannin	11C09-N05	1
Anzag	Tannin	12171101	1
GEHE	Tannin	12171106	1
Caelo	Tannin	12171103	2
Gehe	Tannin	12171106	1
Caelo	Tannin	12171102	1
Sanacorp	Tannin	12171102	1
Caelo	Tannin	12171110	2
Caelo	Tannin	12301515	1
Caelo	Tannin	12336001	10
Gehe	Tannin	12336001	1
Alliance Healthcare	Tannin	12336001	1
Fagron	Tannin	12336001	2
Caelo	Tannin	12336005	2
Caelo	Tannin	12336007	2
Sanacorp	Tannin	12336011	1
Caelo	Tannin	12336013	3
Caelo	Tannin	12336014	5
Phoenix	Tannin	12336013	1
Sanacorp	Tannin	12336014	1
Gehe	Tannin	12336016	2
Anzag, 24.10.2012	Tannin	12A27-N01	1
Fagron	Tannin	12A27-N01	1
Caelo	Tannin	1236001	1
Fagron	Tannin	12E21-N04	5
Gehe	Tannin	12H14-N05	1
Caelo	Tannin	13031401	1
Fagron	Tannin	13B28-N08	1
Caelo	Tannin	13E27-N08	1
Fagron	Tannin	13H30-B03-287645	2
Fagron	Tannin	13H30-B03287645	1
Caelo	Tannin	14031905	3
Caelo	Tannin	14031903	1
Caelo	Tannin	14031912	2
Sanacorp	Tannin	14031912	1
Caelo	Tannin	14031915	2
Caelo	Tannin	14031918	2
Caelo	Tannin	14031919	5
Caelo	Tannin	14031920	1
Fagron	Tannin	14A07-B01-293468	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Tannin	14E07-B03-298480	1
Fagron	Tannin	14e07-b03-298480	1
Fagron	Tannin	14J06-B04-0858	1
Fagron	Tannin	14J06-B04	1
Fagron	Tannin	14J06-B04-299398	1
Fagron	Tannin	14J06B04299398	1
Caleo/Phoenix	Tannin	14K17-B08-306993	1
phönix	Tannin	15/AKD65	1
Caelo	Tannin	15091503	1
Caelo	Tannin	15091504	3
Ebert u. Jacobi 16.0...	Tannin	15091509	1
Caelo	Tannin	15091509	1
Caelo	Tannin	1509503	1
Caelo	Tannin	15243801	6
Caelo	Tannin	15243802	3
Fagron	Tannin	160300029	2
Caelo	Tannin	21101305	1
Fagron	Tannin	160300069	1
Caelo	Tannin	28011502	1
Gatt-Koller / Phoenix	Tannin	3335/08134613	1
Gatt-Koller / Phoenix	Tannin	333508134613	2
Synopharm/Anzag	Tannin	3411I-01052	1
Caelo	Tannin		1
Nachprüfung	Tannin	5210A-01052	1
Caelo	Tannin	4413I1052	1
Fagron	Tannin	13E27-N08	1
Caelo	Tannin	1524308	1

- 55 813 spectra from 335 *Apo-Ident* customers from a total of 20 542 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tannin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tannin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	40	0	81 308
Type C	0	186	2	55 813

The substance/substance group *Tannin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	98.9362 % (> 97.3404 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20018	20018	0.00	50.94
21608	20018	15.63	52.07
21653	20018	16.53	52.59

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tartaric acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20014-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tartaric acid; Acidum tartaricum

Special notes

When selecting the *Tartaric acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tartaric acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tartaric acid	15130201	22383	40	20150416
Caelo	Tartaric acid	15164001	22384	40	20150513
Fagron	Tartaric acid	13I25-B01-294093	22391	40	20131008
Fagron	Tartaric acid	14G07-B02-308554	22501	40	20140827
Caelo	Tartaric acid	161468	22613	40	20160607*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Tartaric acid*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 230 spectra of 7 reference samples from the substance/substance group *Tartaric acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tartaric acid	90800249	20014	30
Caelo	Tartaric acid	10199711	20493	40
Caelo	Tartaric acid	12044101	20494	40
Caelo	Tartaric acid	13217803	21457	60
Caelo	Tartaric acid	15130201	22383 [†]	20
Caelo	Tartaric acid	15164001	22384 [†]	20
Fagron	Tartaric acid	13I25-B01-294093	22391 [†]	20

- 81 118 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 150 spectra from 81 *Apo-Ident* customers from 95 batches from the substance/substance group *Tartaric acid*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Beiersdorf AG	Tartaric acid	11G19-N08	1
Fischar/Phönix	Tartaric acid	704021	1
Fagron	Tartaric acid	13B15-N01	6
Fagron	Tartaric acid	12F18-No2	1
Fagron	Tartaric acid	12131	2
Phoenix	Tartaric acid	12Ho2-N07	1
Caelo	Tartaric acid	10b25-n05	1
Otto Fischer	Tartaric acid	7020601	1
Phönix Gotha	Tartaric acid	704021	1
Noweda/ Fischar	Tartaric acid	702061	1
Gehe	Tartaric acid	703061	1
Spangropharm	Tartaric acid	10073111	1
Otto Fischer	Tartaric acid	705061	2
schubert / Phoenix	Tartaric acid	1014PLV-755	1
Fischar	Tartaric acid	704061	1
ANZAG am 16.05.2012	Tartaric acid	10180708	1
Caelo	Tartaric acid	10180708	2
Caelo	Tartaric acid	10180713	2
ANZAG am 15.05.2012	Tartaric acid	1108049-01	1
Caelo	Tartaric acid	10180714	1
Caelo	Tartaric acid	10199706	1
Caelo	Tartaric acid	10199713	1
Caelo	Tartaric acid	11169406	2
Fagron	Tartaric acid	1106211053	1
Fagron	Tartaric acid	11E24-N06	1
Phönix	Tartaric acid	1106023-01	1
Phönix	Tartaric acid	11e24-n06	1
Fagron	Tartaric acid	11E24-N060752/764	2
Noweda	Tartaric acid	11G19-N08	1
Caelo	Tartaric acid	12044101	2
Caelo	Tartaric acid	1204102	1
Euro OTC	Tartaric acid	12044101	1
Caelo	Tartaric acid	12044102	4
Caelo	Tartaric acid	12044103	4
Caesar & Loretz/ Noweda	Tartaric acid	12044103	1
Caelo	Tartaric acid	12044112	1
Phoenix	Tartaric acid	12044115	1
Caelo	Tartaric acid	12240402	1
Caelo	Tartaric acid	12240413	1
Caelo	Tartaric acid	12286903	2
Caelo	Tartaric acid	12044119	3
Caelo	Tartaric acid	12240415	1
Phönix	Tartaric acid	12286904	1
Caelo	Tartaric acid	12286904	1
canea, anzag	Tartaric acid	12286906	1
Caelo	Tartaric acid	12286906	3
Caelo	Tartaric acid	12286911	1
Caelo	Tartaric acid	12286924	1
Caelo	Tartaric acid	12286927	1
Caelo	Tartaric acid	12286932	2
Caelo	Tartaric acid	12286929	1
Caelo	Tartaric acid	12286934	1
Caelo	Tartaric acid	12286936	1
Caelo	Tartaric acid	12286939	1
Fagron	Tartaric acid	12F18-N02	1
Fagron	Tartaric acid	12H02-N07	5
Fagron	Tartaric acid	12K16-N02	1
Phoenix	Tartaric acid	12K29B01	1
Fagron	Tartaric acid	13/25-B01-285487	1
GEHE 14.04.2014	Tartaric acid	12H02-N07	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Tartaric acid	13/25-B01-285488	2
Caelo	Tartaric acid	12H02-n07	1
Caelo	Tartaric acid	13116306	3
Caelo	Tartaric acid	13116307	1
Anzag	Tartaric acid	13116308	1
Caelo	Tartaric acid	13116308	4
Phoenix	Tartaric acid	13116308	1
Caelo	Tartaric acid	13217806	2
Gehe	Tartaric acid	1325-B01-285487	1
Fagron	Tartaric acid	1325-B01-285488	1
Fagron	Tartaric acid	1325-B01-294093	1
Fagron	Tartaric acid	13B15N01	1
Caelo	Tartaric acid	13B15-N01	1
GEHE 07.05.2014	Tartaric acid	13G03-N14	2
Fagron	Tartaric acid	13I25-B01-285488	1
Fagron	Tartaric acid	13I25-B01-294093	1
Fagron	Tartaric acid	13I25-B01-294094	2
Caelo	Tartaric acid	14054521	1
Fagron	Tartaric acid	13I25-B01-294095	1
Fagron	Tartaric acid	13I25-B01-285488	1
Caelo	Tartaric acid	14186213	3
Fagron	Tartaric acid	14186212	1
Caelo	Tartaric acid	15045302	2
Caelo	Tartaric acid	14G07-B02-308555	1
Caelo	Tartaric acid	15130201	3
Caelo	Tartaric acid	15045303	1
Caelo	Tartaric acid	151302	1
Caelo	Tartaric acid	15130205	1
Caelo	Tartaric acid	15164001	1
Caelo	Tartaric acid	15164002	2
Caelo	Tartaric acid	15164008	1
Caelo	Tartaric acid	15349105	1
Fagron	Tartaric acid	2112I-01053	1
Fagron	Tartaric acid	2414E1053	1
Caelo	Tartaric acid	17091402	1
Fagron	Tartaric acid	20151112-2	1
Fagron	Tartaric acid	2513M01053	1
Fagron	Tartaric acid	2405211053	1
Gatt-Koller / Phoenix	Tartaric acid	3334/08131514	1
Caelo	Tartaric acid	4110N-01053	1
Gehe	Tartaric acid	7284696	1
Caelo	Tartaric acid	9494239	1
Phoenix 28.08.2012	Tartaric acid	702061	1
Caelo	Tartaric acid		1
Caelo	Tartaric acid	11k10-n07	1
Fagron	Tartaric acid	10024	1
Fagron	Tartaric acid	xxxxxxx	1

- 55 851 spectra from 335 *Apo-Ident* customers from a total of 20 518 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tartaric acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tartaric acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	229	1	81 095
Type C	0	144	6	55 850

The substance/substance group *Tartaric acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9854 %)	99.5652 % (> 98.2609 %)
Type C	100.0000 % (> 99.8623 %)	96.0000 % (> 94.0000 %)

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
22383	22613	4.27	44.00
22384	22613	27.22	47.89
22391	22613	14.56	46.69
22501	22613	15.50	44.88
22613	22613	0.00	44.39

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Taurine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20403-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Taurine; Taurinum

Special notes

When selecting the *Taurine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Taurine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Taurine	10K15-N01	20403	40	20101118
Euro OTC	Taurine	1306024-01	21108	40	20130822
Euro OTC	Taurine	1504032-01	21893	40	20150430
Euro OTC	Taurine	1504032-01	21992	40	9167
Euro OTC	Taurine	1602011	22370	40	20160218*

Validation samples

A total of 213 227 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 *Taurine*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 110 spectra of 5 reference samples from the substance/substance group *Taurine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Taurine	1306024-01	21108 [†]	10
Euro OTC	Taurine	1504032-01	21893 [†]	20
Euro OTC	Taurine	1504032-01	21992 [†]	20
Euro OTC	Taurine	1602011	22370 [†]	20
Euro OTC	Taurine	1607035	22795	40

- 81 238 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 23 spectra from 5 *Apo-Ident* customers from 9 batches from the substance/substance group *Taurine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Pharmorgana	Taurine	1000140138	1
Euro OTC	Taurine	1203018-01	3
El Compra Import	Taurine	1202125	1
Euro OTC	Taurine	1111012-01	1
Gehe 18.06.2013	Taurine	1106088	1
hannes	Taurine	1202125	1
Euro OTC	Taurine	1302016-01	5
Euro OTC	Taurine	1306024-01	7
Gall Pharma / Phoenix	Taurine		1
Euro OTC	Taurine	1306024-02	2

- 55 978 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Taurine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Taurine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	110	0	81 238
Type C	0	23	0	55 978

The substance/substance group *Taurine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.5455 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 73.9130 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20403	22370	3.77	69.18
21108	22370	2.42	63.96
21893	21992	1.01	61.90
21992	21992	0.00	61.87
22370	22370	0.00	61.47

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Testosterone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20961-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Testosterone; Testosteronum

Special notes

When selecting the *Testosterone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Testosterone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Testosterone	12F13-N02	20729	40	20120628
Euro OTC	Testosterone	1307001-01	20961	40	1402309
Caelo	Testosterone	13406004	21370	40	20131219
Caelo	Testosterone	13406004	21371	40	20131219
Fagron	Testosterone	15E18-B08-307772	21970	40	20150526
Caelo	Testosterone	15244906	21987	40	20150814

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Testosterone	1511005-01	21994	40	20151119
Euro OTC	Testosterone	1511005	22232	40	20151119*
Euro OTC	Testosterone	1604049	22561	40	20160510*
Fagron	Testosterone	15E18-B08-307772	21970SI	35	20150526
Caelo	Testosterone	15244906	21987SI	24	20150814
Euro OTC	Testosterone	1511005-01	21994SI	22	20151119
Euro OTC	Testosterone	1511005	22232SI	25	20151119*
Euro OTC	Testosterone	1604049	22561SI	34	20160510*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 500 spectra of 14 reference samples from the substance/substance group *Testosterone*. These samples are listed above in the [calibration samples](#) section.
- 75 378 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 293 spectra of 12 reference samples from the substance/substance group *Testosterone*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Testosterone	10F14-N01	20242	40
Euro OTC	Testosterone	1106011-01	20591	40
Fagron	Testosterone	15E18-B08-307772	21970 [†]	20
Caelo	Testosterone	15244906	21987 [†]	20
Euro OTC	Testosterone	1511005-01	21994 [†]	20
Euro OTC	Testosterone	1511005	22232 [†]	20
Euro OTC	Testosterone	1607013	22707	40
Fagron	Testosterone	15E18-B08-307772	21970SI [†]	19
Caelo	Testosterone	15244906	21987SI [†]	14
Euro OTC	Testosterone	1511005-01	21994SI [†]	10
Euro OTC	Testosterone	1511005	22232SI [†]	10
Euro OTC	Testosterone	1607013	22707SI	40

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 81 055 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 60 spectra from 29 *Apo-Ident* customers from 35 batches from the substance/substance group *Testosterone*.

Supplier	Substance	Batch	Spectra
Caelo	Testosterone	11/07-N12	2
EuRho	Testosterone	1106011-03	2
Caelo	Testosterone	12176305	3
Euroo/Phoenix	Testosterone	1307001-01	1
Euro OTC	Testosterone	1307001-01	6
Caelo	Testosterone	13134806	4
Spirig	Testosterone	13406003	1
Caelo	Testosterone	13406004	2
Fagron	Testosterone	13G10-N03	2
Fagron	Testosterone	13I26-N08	1
Euro OTC	Testosterone	1404002-01	2
Fagron	Testosterone	13L09-B03-294148	1
Phönix Gotha	Testosterone	1408015-01	1
Euro OTC	Testosterone	1404002-1	1
Euro OTC	Testosterone	140400201	1
Caelo	Testosterone	14201105	1
Caelo	Testosterone	14355605	1
Caelo	Testosterone	15412201	1
Caelo	Testosterone	15195803	1
Caelo	Testosterone	15412202	1
Caelo	Testosterone	16225807	2
Fagron	Testosterone	GTJ151103	1
Shandong Northwest Manu...	Testosterone	GTJ160510	1
NWM CHina	Testosterone	TE150402	1
Euro OTC	Testosterone	1106011-01	2
Phönix Gotha	Testosterone	1106011-03	1
Euro OTC	Testosterone	1106011-03	2
Euro OTC	Testosterone	1207005-02	2
Euro OTC	Testosterone	110611-003	1
Euro OTC	Testosterone	1106011-03	1
Großhandel	Testosterone	12F13-N02	1
Caelo	Testosterone	13134804	1
Großhandel	Testosterone	13610-N03	1
Großhandel	Testosterone	13G10-N03	1
Haihang Industry	Testosterone	20140114-1	1
Haihang Industry	Testosterone	20140114-2	1
Euro OTC	Testosterone	3x1106011-03	1
Caelo	Testosterone	APL00034466T	1
Fagron	Testosterone	12F13-N02	1

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
EUro/AHD	Testosterone	1106011-03	1
Caelo	Testosterone	12176301	1

- 55 941 spectra from 335 *Apo-Ident* customers from a total of 20 577 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Testosterone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Testosterone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	500	0	75 378
Type B	0	293	0	81 055
Type C	0	55	5	55 941

The substance/substance group *Testosterone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.8000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.9522 %)
Type C	100.0000 % (> 99.8622 %)	91.6667 % (> 86.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20729	22561	16.23	38.77
20961	20961	0.00	39.21

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21370	22232	8.50	37.67
21371	20961	7.96	37.85
21970	22232	3.11	36.92
21987	22232	3.15	35.99
21994	22232	2.93	35.03
22232	22232	0.00	35.97
22561	22561	0.00	29.74

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Testosterone propionate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20880-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Testosterone propionate; Testosteroni propionas; Testosteronum propionicum

Special notes

When selecting the *Testosterone propionate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Testosterone propionate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Testosterone pro...	12163607	20880	40	AR-15-FG-000623-01
Euro OTC	Testosterone pro...	1109024-02	21644	40	1503607
Euro OTC	Testosterone pro...	1511003	22230	40	20151111*
Euro OTC	Testosterone pro...	1512023	22288	30	20151230*
Euro OTC	Testosterone pro...	1511003	22230SI	28	20151111*
Euro OTC	Testosterone pro...	1512023	22288SI	30	20151230*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 208 spectra of 6 reference samples from the substance/substance group *Testosterone propionate*. These samples are listed above in the [calibration samples](#) section.
- 75 670 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 85 spectra of 5 reference samples from the substance/substance group *Testosterone propionate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Testosterone propionate	1109024-02	21644 [†]	20
Euro OTC	Testosterone propionate	1511003	22230 [†]	20
Euro OTC	Testosterone propionate	1512023	22288 [†]	15
Euro OTC	Testosterone propionate	1511003	22230SI [†]	15
Euro OTC	Testosterone propionate	1512023	22288SI [†]	15

- 81 263 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 203 spectra from 105 *Apo-Ident* customers from 92 batches from the substance/substance group *Testosterone propionate*.

Supplier	Substance	Batch	Spectra
Caelo	Testosterone propionate	10L03-N16	2
Apomix / AHD	Testosterone propionate	40/14	1
Euro OTC	Testosterone propionate	1109024-01	1
Euro OTC	Testosterone propionate	1109024-03	1
Caelo	Testosterone propionate	1109024-02	1
Fagron	Testosterone propionate	11G15-N07	2
Caelo	Testosterone propionate	12163610	3
Caelo	Testosterone propionate	12163612	6
Phönix	Testosterone propionate	12163613	1
phoenix	Testosterone propionate	12163615	1
Caelo	Testosterone propionate	12163616	3
Caelo	Testosterone propionate	12163617	4
Phönix	Testosterone propionate	12163617	1
Caelo	Testosterone propionate	12163619	1
Fagron	Testosterone propionate	13C08-N02	14
Fagron	Testosterone propionate	13F05-N04	14
Phönix	Testosterone propionate	13K25-B05	1
Fagron	Testosterone propionate	13K25-B05-287647	9
Fagron	Testosterone propionate	13K25-B05-287648	4
Fagron	Testosterone propionate	13K25B05287648	1
Fagron	Testosterone propionate	13K25-B05-291974	1
Euro OTC	Testosterone propionate	1409037-01	1
Fagron	Testosterone propionate	14A28-B12	2
Fagron	Testosterone propionate	14A28-B12-296958	1
Fagron	Testosterone propionate	14A28-B12-296960	1
Fagron	Testosterone propionate	14D15-B03-296959	3
Fagron	Testosterone propionate	14A28-B12-291977	1
Fagron	Testosterone propionate	14L31-B02	2
Fagron	Testosterone propionate	14L31-B02-304721	4
Fagron	Testosterone propionate	14L31B02-304721	1
Fagron	Testosterone propionate	14L31B02304722	1
Caelo	Testosterone propionate	14L31-B02-304722	2
Fagron	Testosterone propionate	14L31-B02-304722	2
Caelo	Testosterone propionate	15003002	5
Caelo	Testosterone propionate	15003008	1
Fagron	Testosterone propionate	1501-B09-312867	1
Euro OTC	Testosterone propionate	1511003-01	2
Euro OTC	Testosterone propionate	1504023-01	1
Caelo	Testosterone propionate	15169504	1
Phönix	Testosterone propionate	15444702	1
Caelo	Testosterone propionate	15444703	4
Ebert 17.08.16	Testosterone propionate	15444703	1
Fagron	Testosterone propionate	15k03-b03	1
Fagron	Testosterone propionate	15D03-B02-310694	1
Fagron	Testosterone propionate	15I01-B09-312867	2
Fagron	Testosterone propionate	15K03-B-03-315218	1
Fagron	Testosterone propionate	15K03-B03-315218	2
Galderma	Testosterone propionate	15K03-B03-315218	1
Fagron	Testosterone propionate	16C24-B04-320784	1
Fagron	Testosterone propionate	16E24-B01-322593	2
Fagron	Testosterone propionate	36513M1	2
Fagron	Testosterone propionate	36814M1	1
Audor Pharma	Testosterone propionate	AP1109024-03TP	3
Caelo	Testosterone propionate	36814m1	1
Audor Pharma	Testosterone propionate	APZTSP15003-MTP	1
Fagron	Testosterone propionate	6081201	1
Caelo	Testosterone propionate	614E2376	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Testosterone propionate	106212376	1
Caelo	Testosterone propionate	903312376	1
Caelo	Testosterone propionate	10235809	1
Caelo	Testosterone propionate	612212376	1
Caelo	Testosterone propionate	10235821	1
Finze	Testosterone propionate	10366002	1
Fagron	Testosterone propionate	10L03-N16	1
Phönix/Euro	Testosterone propionate	110301002	1
Fagron	Testosterone propionate	11/12-N03	1
Euro OTC	Testosterone propionate	1103010-01	1
Phönix	Testosterone propionate	1103010-02	1
Caelo	Testosterone propionate	1108212376	1
Phoenix	Testosterone propionate	1109024-02	1
Andor	Testosterone propionate	1109024-03TP	1
Fagron	Testosterone propionate	11C21-N09	1
Fagron	Testosterone propionate	11K18-N04	5
Noweda	Testosterone propionate	11K18-N04	1
Caelo	Testosterone propionate	11K18-N04	1
Fagron	Testosterone propionate	12/10-N08	1
Caelo	Testosterone propionate	12060102	3
Fagron	Testosterone propionate	12C01-N01	1
Caelo	Testosterone propionate	12163605	1
Caelo	Testosterone propionate	12163607	1
Caelo	Testosterone propionate	12163615	1
Fagron	Testosterone propionate	12163616	2
Caelo	Testosterone propionate	1263607	1
Fagron	Testosterone propionate	12A02-N05	5
Caelo	Testosterone propionate	12A02-N05	1
Fagron	Testosterone propionate	12E04-N01	4
Fagron	Testosterone propionate	12C01-N01	1
Fagron	Testosterone propionate	12E29-N02	1
Fagron	Testosterone propionate	12J10-N08	3
Fagron	Testosterone propionate	12J10N-08	1
Caelo	Testosterone propionate	12J10-N08	1
Phönix	Testosterone propionate	12J10-N08	1
Fagron	Testosterone propionate	13/03-N02	1
Phönix	Testosterone propionate	13C08-N02	2
Fagron	Testosterone propionate	13C08N02	1
Jenne	Testosterone propionate	13C08-N02	1
Fagron	Testosterone propionate	20121012-3	1
Fagron	Testosterone propionate	32012M1	3
Caelo	Testosterone propionate	2013U-02376	1
Fagron	Testosterone propionate	24411M1	1
Euro OTC	Testosterone propionate	970116/1	1
Fagron	Testosterone propionate	3613M-02376	1
Audor Pharma	Testosterone propionate	AP12E04N01TP	2
Anzag 21.02.2013	Testosterone propionate	AP12E04-N01TP	1
Anzag 04.09.12	Testosterone propionate	AP12E04-N01TP	1
AHD	Testosterone propionate	AP12E04-N01TP	1
Fagron	Testosterone propionate		1
Audor Pharma	Testosterone propionate	AP12J10-N08TP	1
Audor Pharma	Testosterone propionate	AP-12J10-N08Tp	1

- 55 798 spectra from 335 *Apo-Ident* customers from a total of 20 520 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Testosterone propionate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Testosterone propionate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	208	0	75 670
Type B	0	85	0	81 263
Type C	0	199	4	55 798

The substance/substance group *Testosterone propionate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.1154 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.9412 %)
Type C	100.0000 % (> 99.8622 %)	98.0296 % (> 96.5517 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20880	20880	0.00	8.23
21644	21644	0.00	6.69
22230	22230	0.00	8.73
22288	22288	0.00	8.72

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tetracaine base**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20947-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tetracaine base; Tetracainum

Special notes

When selecting the *Tetracaine base* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tetracaine base*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tetracaine base	12L19-N10	20947	40	20130108
Euro OTC	Tetracaine base	1405025-01	21603	40	AR-14-FG-012475-01
Fagron	Tetracaine base	14A16-B04-292915	21650	40	20140205
Fagron	Tetracaine base	14A16-B04-292916	21659	40	20140205
Euro OTC	Tetracaine base	1512022	22299	30	20160128*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 190 spectra of 5 reference samples from the substance/substance group *Tetracaine base*. These samples are listed above in the [calibration samples](#) section.
- 75 688 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 255 spectra of 7 reference samples from the substance/substance group *Tetracaine base*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tetracaine base	10H05-N08	20231	40
Euro OTC	Tetracaine base	1405025-01	21603 [†]	20
Fagron	Tetracaine base	14A16-B04-292915	21650 [†]	80
Fagron	Tetracaine base	14A16-B04-292916	21659 [†]	20
Euro OTC	Tetracaine base	1512022	22299 [†]	15
Euro OTC	Tetracaine base	1606009	22717	40
Euro OTC	Tetracaine base	1609010	22858	40

- 81 093 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 76 spectra from 33 *Apo-Ident* customers from 36 batches from the substance/substance group *Tetracaine base*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine base	12081501	1
Euro OTC	Tetracaine base	1312034-01	7
Phönix	Tetracaine base	1312034-01	1
GEHE 04.05	Tetracaine base	1405025-01	1
Fagron	Tetracaine base	14A16-B04	1
Fagron	Tetracaine base	14A16-B04-2490207	1
GEHE 02.05.2014	Tetracaine base	14A16-B04-290208	3
Caelo	Tetracaine base	14A16-B04-290207	1
Fagron	Tetracaine base	14A16-B04-290208	2
Caelo	Tetracaine base	14A16-B04-292916	1
Fagron	Tetracaine base	14A16-B04-292916	1
Phoenix 07.10.14	Tetracaine base	14A16-B04-292916	1
Fagron	Tetracaine base	14G30-B08	2
Euro OTC	Tetracaine base	151022-01	1
Phoenix Goettin	Tetracaine base	14G30-B08-297306	1
Caelo	Tetracaine base	1512022-01	1
Caelo	Tetracaine base	16A13-B07-318736	2
Fagron	Tetracaine base	TC0090913	2
Fagron	Tetracaine base	2913Q-07165	1
Phönix	Tetracaine base	3465093	1
Fagron	Tetracaine base	5111202	1
Fagron	Tetracaine base	11D07-N20	1
Phönix	Tetracaine base	11G12-n13	1
Fagron	Tetracaine base	11G12-N13	4
Fagron	Tetracaine base	12F26-N05	2
Fagron	Tetracaine base	11L09-N03	3
Fagron	Tetracaine base	11101-N09	1
Phönix 19.06.2012	Tetracaine base	11L09-N03	1
Fagron	Tetracaine base	12F29-N05	7
phönix, 14.11.2012	Tetracaine base	12F-29-N05	1
Fagron	Tetracaine base	12f29-n05	1
Phoenix 26.03.2013	Tetracaine base	12F29-N05	1
Fagron	Tetracaine base	12H23-N07	2
Anzag 08.03.2013	Tetracaine base	12L19-N10	2
Fagron	Tetracaine base	12L19-N10	5
Phönix	Tetracaine base	1303018-01	1
Fagron	Tetracaine base	13D30-N11	2
Caelo	Tetracaine base	T-290413-1	1
Fagron	Tetracaine base	3465093	1
Euro OTC	Tetracaine base	1405025-01	1
Fagron	Tetracaine base	14A16-B04-290209	1
Fagron	Tetracaine base	14g30-b08-297305	1
Fagron	Tetracaine base	14G30-B08-297307	1
Fagron	Tetracaine base	14G30-B08-297305	1
Caelo	Tetracaine base	14K03-B02-303179	1

- 55 925 spectra from 335 *Apo-Ident* customers from a total of 20 575 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tetracaine base* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracaine base* and it was evaluated

how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	190	0	75 688
Type B	0	208	47	81 093
Type C	0	72	4	55 925

The substance/substance group *Tetracaine base* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.8421 %)
Type B	100.0000 % (> 99.9853 %)	81.5686 % (> 80.3922 %)
Type C	100.0000 % (> 99.8622 %)	94.7368 % (> 90.7895 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20947	21603	2.73	51.76
21603	21603	0.00	52.21
21650	22299	5.15	51.47
21659	21603	4.47	52.74
22299	22299	0.00	49.27

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tetracaine hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20037-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tetracaine hydrochloride; Tetracaini hydrochloridum; Tetracainum hydrochloricum

Special notes

When selecting the *Tetracaine hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tetracaine hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tetracaine hydro...	83228149	20037	30	I 2009 000 288
Caelo	Tetracaine hydro...	12019822	20924	40	20120228
Euro OTC	Tetracaine hydro...	1506040	21845	40	20150713*
Euro OTC	Tetracaine hydro...	1512019	22285	30	20151228*
Euro OTC	Tetracaine hydro...	1612005	22912	40	20170112*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 180 spectra of 5 reference samples from the substance/substance group *Tetracaine hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 698 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 4 reference samples from the substance/substance group *Tetracaine hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tetracaine hydrochloride	11A31-N15	20215	40
Euro OTC	Tetracaine hydrochloride	1506040	21845 [†]	20
Euro OTC	Tetracaine hydrochloride	1512019	22285 [†]	15
Euro OTC	Tetracaine hydrochloride	1607031	22708	40

- 81 233 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 478 spectra from 153 *Apo-Ident* customers from 116 batches from the substance/substance group *Tetracaine hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine hydrochloride	1207001-01	14
Euro OTC	Tetracaine hydrochloride	1207001-02	11
Caelo	Tetracaine hydrochloride	1313012-01	1
Großhandel	Tetracaine hydrochloride	12H24-N05	4
Caelo	Tetracaine hydrochloride	13155711	9
Großhandel	Tetracaine hydrochloride	13D11-N07	7
Großhandel	Tetracaine hydrochloride	13H21-B02-286559	1
Sanacorp	Tetracaine hydrochloride	15/AKD1	1
Caelo	Tetracaine hydrochloride		1
Fagron	Tetracaine hydrochloride	6093549	1
Alliance Health 22.08.2...	Tetracaine hydrochloride	6093549	1
Caelo	Tetracaine hydrochloride	6093549	1
Fagron	Tetracaine hydrochloride	10330837	1
Gatt-Koller / Phoenix	Tetracaine hydrochloride	80/02140614	2
Fagron	Tetracaine hydrochloride	10990834	2
Caelo	Tetracaine hydrochloride	12019822	7
Euro OTG	Tetracaine hydrochloride	1207001-01	1
Euro OTC	Tetracaine hydrochloride	1303012-01	20
gehe	Tetracaine hydrochloride	12C22-N04	1
Alliance Health 30.04.2...	Tetracaine hydrochloride	1303012-01	2
Euro OTC	Tetracaine hydrochloride	130301201	3
Euro OTC	Tetracaine hydrochloride	1310006-01	19
Phoenix am 30.04.2014	Tetracaine hydrochloride	1310006-01	1
Gehe	Tetracaine hydrochloride	1310006-01	4
EuroTOC / Noweda	Tetracaine hydrochloride	131000601	2
Noweda	Tetracaine hydrochloride	1310006-01	1
Caelo	Tetracaine hydrochloride	13155703	1
Caelo	Tetracaine hydrochloride	13155705	3
Caelo	Tetracaine hydrochloride	13155706	11
Gehe 07.07.2014	Tetracaine hydrochloride	13155706	1
Euro OTC	Tetracaine hydrochloride	13155710	4
Fagron	Tetracaine hydrochloride	13155711	1
Alliance health	Tetracaine hydrochloride	13155711	2
Caelo	Tetracaine hydrochloride	13155714	2
BASF Fine Chemicals Swi...	Tetracaine hydrochloride	13155714	1
Caelo	Tetracaine hydrochloride	13155716	2
Caelo	Tetracaine hydrochloride	13155724	4
Calo/AHD	Tetracaine hydrochloride	13155727	1
Caelo	Tetracaine hydrochloride	13155727	4
Fagron	Tetracaine hydrochloride	13H21-B02	2
Fagron	Tetracaine hydrochloride	13H21-B02-286558	4
Fagron	Tetracaine hydrochloride	13H21-B02-286559	1
Alliance Health 05.05.2...	Tetracaine hydrochloride	13H21-B02-286559	1
Fagron	Tetracaine hydrochloride	13K25-B04	2
Fagron	Tetracaine hydrochloride		1
Caelo	Tetracaine hydrochloride	13K25-B04-290276	2
Fagron	Tetracaine hydrochloride	13K25-B04-290276	3
Euro OTC	Tetracaine hydrochloride	1405026-01	15
Fagron	Tetracaine hydrochloride	13K25-B04-290278	2
euroct/gehe	Tetracaine hydrochloride	1405026-01	1
Caelo	Tetracaine hydrochloride	1405026-01	1
Gehe	Tetracaine hydrochloride	1405026-01	3
Euro OTC	Tetracaine hydrochloride	1409026	1
Sanacorp	Tetracaine hydrochloride	1409026-01	1
Phoenix Goettin	Tetracaine hydrochloride	1409026-01	1
Euro OTC	Tetracaine hydrochloride	1409026-01	5
Euro OTC	Tetracaine hydrochloride	1409026-02	5
Caelo	Tetracaine hydrochloride	1409026-02	3
BASF Pharma S.A.	Tetracaine hydrochloride	1409026-02	1
Euro OTC	Tetracaine hydrochloride	1411019-01	11

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
EuRP/Geibo	Tetracaine hydrochloride	1411019-01	4
Euro OTC	Tetracaine hydrochloride	141101901	1
Fagron	Tetracaine hydrochloride	1411019-01	1
Fagron	Tetracaine hydrochloride	1418-03-300199	1
Fagron	Tetracaine hydrochloride	14C18-B03-293966	3
Alliance Health	Tetracaine hydrochloride	14C18-B03-293967	1
Fagron	Tetracaine hydrochloride	14C18-B03-293967	2
Fagron	Tetracaine hydrochloride	14C18-B03-300199	3
Caelo	Tetracaine hydrochloride	14C18-B03-300199	1
Fagron	Tetracaine hydrochloride	14C18-B03-300200	3
Caelo	Tetracaine hydrochloride	14C18-B03-300200	1
Fagron	Tetracaine hydrochloride	14c18d03300199	1
Fagron	Tetracaine hydrochloride	14G14-B08-300198	2
Euro OTC	Tetracaine hydrochloride	1506040-01	9
Caelo	Tetracaine hydrochloride	150604001	1
Euro/Phönix	Tetracaine hydrochloride	1506040-01	1
Euro OTC	Tetracaine hydrochloride	1506040-02	3
Caelo	Tetracaine hydrochloride	15079501	2
Caelo	Tetracaine hydrochloride	15079507	1
Euro OTC	Tetracaine hydrochloride	1512019-01	5
Caelo	Tetracaine hydrochloride	15196102	1
Caelo	Tetracaine hydrochloride	15196103	4
Caelo	Tetracaine hydrochloride	15196104	2
Caelo	Tetracaine hydrochloride	15356902	2
Phoenix	Tetracaine hydrochloride	15437104	2
Caelo	Tetracaine hydrochloride	15437102	1
Caelo	Tetracaine hydrochloride	15437104	10
Caelo	Tetracaine hydrochloride	15437109	6
Fagron	Tetracaine hydrochloride	15A12-B03-308857	4
AHD	Tetracaine hydrochloride	15A12-B03-308857	1
Caelo	Tetracaine hydrochloride	15H24-B03	3
Fagron	Tetracaine hydrochloride	15H24-B03-311450	5
Euro OTC	Tetracaine hydrochloride	17081503	1
Caelo	Tetracaine hydrochloride	4827030	2
Caelo	Tetracaine hydrochloride	15K04-B03-318369	1
BASF/ Phoenix	Tetracaine hydrochloride	6093547	1
Fagron	Tetracaine hydrochloride	15H24-B03-313594	2
Orgamol Pharma	Tetracaine hydrochloride	6093547	1
Euro OTC	Tetracaine hydrochloride	6093547	1
Caelo	Tetracaine hydrochloride	9070003	1
Caelo	Tetracaine hydrochloride	10118210	2
Anzag 19.06.2012	Tetracaine hydrochloride	10118218	1
Caelo	Tetracaine hydrochloride	10118218	1
Caelo	Tetracaine hydrochloride	10118211	1
gehe, 03.01.2013	Tetracaine hydrochloride	10118211	1
Caelo	Tetracaine hydrochloride	10118225	6
Fagron	Tetracaine hydrochloride	10A29-N12	2
Fagron	Tetracaine hydrochloride	11/15-N12	2
Noweda	Tetracaine hydrochloride	11/15-N12	2
Euro OTC	Tetracaine hydrochloride	1106035-01	1
Noweda	Tetracaine hydrochloride	1106035-01	2
EuRho	Tetracaine hydrochloride	1106035-01	2
Noweda	Tetracaine hydrochloride	1106035-02	1
EuRho	Tetracaine hydrochloride	1110010-01	2
Euro OTC	Tetracaine hydrochloride	1110010-01	6
Caelo	Tetracaine hydrochloride	1110010-01	1
Euro OTC	Tetracaine hydrochloride	1110010-02	5
Caelo	Tetracaine hydrochloride	1110010-02	2
anzag, 14.11.2012	Tetracaine hydrochloride	1110010-02	1
Euro OTC	Tetracaine hydrochloride	11110010-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Tetracaine hydrochloride	111001002	1
Fagron	Tetracaine hydrochloride	11A31-N15	1
Fagron	Tetracaine hydrochloride	11I15-N12	1
Fagron	Tetracaine hydrochloride	11C22-N04	1
Caelo	Tetracaine hydrochloride	12019802	4
Sanacorp	Tetracaine hydrochloride	12019803	1
Phoenix 26.03.2013	Tetracaine hydrochloride	12019809	1
Caelo	Tetracaine hydrochloride	12019810	5
Caelo	Tetracaine hydrochloride	12019812	3
Phönix 13.05.2013	Tetracaine hydrochloride	12019810	2
Caelo	Tetracaine hydrochloride	12019816	10
Caelo	Tetracaine hydrochloride	12019815	1
phönix 14.08.2013	Tetracaine hydrochloride	12019816	1
Caelo	Tetracaine hydrochloride	12019820	1
Sino Phyto	Tetracaine hydrochloride	12019816	1
Gehe 05.11.2013	Tetracaine hydrochloride	12019822	1
Fagron	Tetracaine hydrochloride	1207001-01	5
Noweda	Tetracaine hydrochloride	120700-02	1
Anzag 07.03.13	Tetracaine hydrochloride	1207001-01	2
Caelo	Tetracaine hydrochloride	1207001-01	1
GEHE	Tetracaine hydrochloride	1207001-01	1
EuRho Anzag	Tetracaine hydrochloride	1207001-01	1
Euro CT Phönix	Tetracaine hydrochloride	1207001-02	1
Fagron	Tetracaine hydrochloride	12C22-N04	7
Fagron	Tetracaine hydrochloride	12H24-N05	8
Noweda	Tetracaine hydrochloride	12H24-N05	2
Noweda/ BASF Pharma (Ev...	Tetracaine hydrochloride	12H24-N05	1
Caelo	Tetracaine hydrochloride	12H24-N05	2
Alliance Healthcare	Tetracaine hydrochloride	12H24-N05	1
Caelo	Tetracaine hydrochloride	12h24-n05	1
Noveda	Tetracaine hydrochloride	12H24-N05	1
Fagron	Tetracaine hydrochloride	12H24-N050696/1050	1
Fagron	Tetracaine hydrochloride	12K01-N04	8
Großhandel	Tetracaine hydrochloride	12K01-N04	1
Phoenix	Tetracaine hydrochloride	12K01-N04	1
Fagron	Tetracaine hydrochloride	12H-N05	1
gehe	Tetracaine hydrochloride	1303012	1
Phönix	Tetracaine hydrochloride	130301201	1
Fagron	Tetracaine hydrochloride	1303012-01	1
BASF Pharma S.A.	Tetracaine hydrochloride	1310006-01	1
Caelo	Tetracaine hydrochloride	1310006-01	1
Phönix	Tetracaine hydrochloride	13155710	1
Fagron	Tetracaine hydrochloride	13D11-N07	7
Fagron	Tetracaine hydrochloride	13K25-B04290276	1
Euro OTC	Tetracaine hydrochloride	20160812-2	1
Fagron	Tetracaine hydrochloride	13k25-b04-290276	1
Caelo	Tetracaine hydrochloride	27111305	1
Fagron	Tetracaine hydrochloride	212131/221630-0002	1
Fagron	Tetracaine hydrochloride	13G02-N01	1
Fagron	Tetracaine hydrochloride	13q11-n07	1
EuRho	Tetracaine hydrochloride	2906009V-04	1
Finze	Tetracaine hydrochloride	2906009-02	1
Euro OTC	Tetracaine hydrochloride	2906009V-03	1
Fagron	Tetracaine hydrochloride	3413U02039	1
Fagron	Tetracaine hydrochloride	3913I-02039	1
Fagron	Tetracaine hydrochloride	4313E-02039	1
Euro OTC	Tetracaine hydrochloride	140902601	1
Euro OTG Pharma	Tetracaine hydrochloride	1409026-02	1
Caelo	Tetracaine hydrochloride	1303012-01	2
Caelo	Tetracaine hydrochloride	13155720	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gutenberg-Apotheke	Tetracaine hydrochloride	13D11-N07	1
Euro OTC	Tetracaine hydrochloride	14090-26	1
Euro OTC	Tetracaine hydrochloride	14G14-B08-300202	1
Synopharm/Anzag	Tetracaine hydrochloride	2712Q-02039	1
Jenne	Tetracaine hydrochloride	13D11-No7	1

- 55 523 spectra from 335 *Apo-Ident* customers from a total of 20 498 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tetracaine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracaine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	180	0	75 698
Type B	0	80	35	81 233
Type C	0	440	38	55 523

The substance/substance group *Tetracaine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.6667 %)
Type B	100.0000 % (> 99.9853 %)	69.5652 % (> 66.9565 %)
Type C	100.0000 % (> 99.8622 %)	92.0502 % (> 91.4226 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20037	20037	0.00	60.95
20924	21845	6.01	60.58
21845	21845	0.00	60.57
22285	22285	0.00	60.06
22912	22912	0.00	60.78

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tetracycline hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20044-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tetracycline hydrochloride; Tetracyclini hydrochloridum; Tetracyclinum hydrochloricum

Special notes

When selecting the *Tetracycline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tetracycline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tetracycline hyd...	09C25-N10	20044	30	I 2009 000 352
Euro OTC	Tetracycline hyd...	1302012-01	21079	40	1411585
Caelo	Tetracycline hyd...	13201303	21427	39	20130807
Caelo	Tetracycline hyd...	13201303	21428	40	20130807
Euro OTC	Tetracycline hyd...	1506012	21835	40	0000010322
Caelo	Tetracycline hyd...	161167	22468	40	20160504*
Caelo	Tetracycline hyd...	15230712	22833	40	20150819

Validation samples

A total of 213 227 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 *Tetracycline hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 609 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Tetracycline hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tetracycline hydrochloride	13201303	21427 [†]	20
Caelo	Tetracycline hydrochloride	13201303	21428 [†]	20
Euro OTC	Tetracycline hydrochloride	1506012	21835 [†]	20
Caelo	Tetracycline hydrochloride	161167	22468 [†]	20
Euro OTC	Tetracycline hydrochloride	1603026	22545	40

- 81 228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 183 spectra from 89 *Apo-Ident* customers from 66 batches from the substance/substance group *Tetracycline hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Tetracycline hydrochloride	103201301	1
Euro OTC	Tetracycline hydrochloride	1110029-01	4
EuRho/AHD	Tetracycline hydrochloride		1
Anzag/euRho	Tetracycline hydrochloride		1
Euro OTC	Tetracycline hydrochloride	1204039-02	13
Caelo	Tetracycline hydrochloride	12353616	1
Euro OTC	Tetracycline hydrochloride	1302012-01	8
Caelo	Tetracycline hydrochloride	12353603	5
Aliance am 10.03.2014	Tetracycline hydrochloride	1302012-02	1
Euro OTC	Tetracycline hydrochloride	1302012-02	15
Caelo	Tetracycline hydrochloride	1302012-02	1
Fagron	Tetracycline hydrochloride	13201301	1
Caelo	Tetracycline hydrochloride	13201301	3
Caelo	Tetracycline hydrochloride	13201302	3
Alliance Health 22.08.2...	Tetracycline hydrochloride	13201307	1
Caelo	Tetracycline hydrochloride	13201307	1
Fagron	Tetracycline hydrochloride	13F17-N03	4
Caelo	Tetracycline hydrochloride	13F17-N03	1
Celo/Kehr	Tetracycline hydrochloride	13201307	1
Fagron	Tetracycline hydrochloride	13J22-N04	1
Caelo	Tetracycline hydrochloride	13201309	1
Fagron	Tetracycline hydrochloride	13L10-B02-294455	2
Euro OTC	Tetracycline hydrochloride	1402030-01	5
Phönix/Euro	Tetracycline hydrochloride	1402030-01	1
Caelo	Tetracycline hydrochloride	13L10B02296956	1
Sanacorp	Tetracycline hydrochloride	1402030-01	1
Euro OTC	Tetracycline hydrochloride	1402030-02	6
Fagron	Tetracycline hydrochloride	1402030-02	1
Caelo	Tetracycline hydrochloride	14080605	3
Caelo	Tetracycline hydrochloride	14080606	2
Euro OTC	Tetracycline hydrochloride	14120007-01	1
Bombastus	Tetracycline hydrochloride	1412007-01	1
Euro OTC	Tetracycline hydrochloride	1412007-01	6
Caelo	Tetracycline hydrochloride	1412007-01	1
Caelo	Tetracycline hydrochloride	14364604	3
Caelo	Tetracycline hydrochloride	14364601	1
Caelo	Tetracycline hydrochloride	14364616	2
Caelo	Tetracycline hydrochloride	14364612	1
Caelo	Tetracycline hydrochloride	14364617	2
Fagron	Tetracycline hydrochloride	14H06-B05	2
Fagron	Tetracycline hydrochloride	14H06-B05-299498	1
Fagron	Tetracycline hydrochloride	14H06-B05-303912	3
Fagron	Tetracycline hydrochloride	14H06-B05-311707	1
Fagron	Tetracycline hydrochloride	14H06-Bo5-303912	1
Caelo	Tetracycline hydrochloride	14H06-B05-313591	1
Euro OTC	Tetracycline hydrochloride	1506012-01	12
Caelo	Tetracycline hydrochloride	1506012-01	1
Gehe	Tetracycline hydrochloride	15230703	1
Caelo	Tetracycline hydrochloride	15230707	2
Caelo	Tetracycline hydrochloride	15230703	1
Euro OTC	Tetracycline hydrochloride	1603026-01	2
Caelo	Tetracycline hydrochloride	15230715	1
Caelo	Tetracycline hydrochloride	2714U-02378	1
Caelo	Tetracycline hydrochloride	4315I-02378	1
Caelo	Tetracycline hydrochloride	4012Q-02378	1
Euro OTC	Tetracycline hydrochloride	21111404	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Tetracycline hydrochloride	5091202	1
Caelo	Tetracycline hydrochloride	9248704	1
Euro OTC	Tetracycline hydrochloride	100518-62	1
Caelo	Tetracycline hydrochloride	111002901	1
Gehe	Tetracycline hydrochloride	1110029-01	1
Sanacorp	Tetracycline hydrochloride	100403401	1
Kehr	Tetracycline hydrochloride	1110029-01	1
Euro OTC	Tetracycline hydrochloride	1204039-01	5
Caelo	Tetracycline hydrochloride	1204039	2
Euro OTC	Tetracycline hydrochloride	12040390	1
Noweda	Tetracycline hydrochloride	1204039-01	1
Europharm/Otto	Tetracycline hydrochloride	1204039-01	1
Europharm/Otto	Tetracycline hydrochloride	1204039-02	3
Eurho/Phoenix	Tetracycline hydrochloride	1204039-02	1
Euro OTC	Tetracycline hydrochloride	120403902	1
200, 14.11.2012	Tetracycline hydrochloride	12138104	1
Caelo	Tetracycline hydrochloride	12138104	1
Caelo	Tetracycline hydrochloride	12353602	1
Caelo	Tetracycline hydrochloride	12138106	1
Anzag 30.04.2013	Tetracycline hydrochloride	12353602	1
Caelo	Tetracycline hydrochloride	12353609	1
Caelo	Tetracycline hydrochloride	12353612	2
Caelo	Tetracycline hydrochloride	1235613	1
Fagron	Tetracycline hydrochloride	12E10-N05	1
Fagron	Tetracycline hydrochloride	12J15-N05	1
Phönix Gotha	Tetracycline hydrochloride	1302012-01	1
Euro OTC	Tetracycline hydrochloride	140410-62	1
ningxia	Tetracycline hydrochloride	1412007-01	1
Euro OTC	Tetracycline hydrochloride	141200701	1
Euro OTC	Tetracycline hydrochloride	150601201	1
Caelo	Tetracycline hydrochloride	2612Q-02378	1
Euro OTC	Tetracycline hydrochloride	28021315	1
Caelo	Tetracycline hydrochloride	1103003-02	1
EUro/AHD	Tetracycline hydrochloride	1302012-01	1

- 55 818 spectra from 335 *Apo-Ident* customers from a total of 20 545 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tetracycline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tetracycline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	269	0	75 609
Type B	0	120	0	81 228
Type C	0	176	7	55 818

The substance/substance group *Tetracycline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7695 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	96.1749 % (> 94.5355 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20044	20044	0.00	35.22
21079	21079	0.00	29.78
21427	21835	6.13	32.24
21428	21835	2.61	31.68
21835	21835	0.00	32.07
22468	22468	0.00	29.25
22833	21079	5.87	30.06

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Thalidomide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21552-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thalidomide; Thalidomidum

Special notes

When selecting the *Thalidomide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thalidomide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Thalidomide	14E27B04295348	21552	40	1503608
Caelo	Thalidomide	13395704	21739	40	20140207

Validation samples

A total of 213 227 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 *Thalidomide*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Thalidomide*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Thalidomide	14E27B04295348	21552 [†]	20
Caelo	Thalidomide	13395704	21739 [†]	20
Caelo	Thalidomide	162703	22774	40
Caelo	Thalidomide	15276711	22880	40
Fagron	Thalidomide	15A13-B01-312230	22882	40

- 81 188 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Thalidomide*.

Supplier	Substance	Batch	Spectra
Fagron	Thalidomide	14E27-B04-299297	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thalidomide* can be clearly distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thalidomide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	80	80	81 188
Type C	0	1	0	56 000

The substance/substance group *Thalidomide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	50.0000 % (> 48.1250 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21552	21552	0.00	44.12
21739	21552	18.11	55.49

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Theophylline**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20723-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Theophylline; Theophyllinum

Special notes

When selecting the *Theophylline* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Theophylline*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Theophylline	12166316	20723	40	1402055
Caelo	Theophylline	12341101	21740	40	20121115

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Theophylline*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Theophylline*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Theophylline	12341101	21740 [†]	20

- 81 328 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 11 *Apo-Ident* customers from 8 batches from the substance/substance group *Theophylline*.

Supplier	Substance	Batch	Spectra
Caelo	Theophylline	12341101	2
Caelo	Theophylline	12341104	1
Caelo	Theophylline	12166305	2
Caelo	Theophylline	12166306	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
Noweda	Theophylline	12166305	1
Caelo	Theophylline	12166311	1
Caelo	Theophylline	12166312	1
Caelo	Theophylline	12166315	1
Caesar&lorenz,Phoenix	Theophylline	12166315	1
Caelo	Theophylline	3912A-02382	1

- 55 989 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Theophylline* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Theophylline* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	20	0	81 328
Type C	0	12	0	55 989

The substance/substance group *Theophylline* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 70.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20723	20723	0.00	80.78
21740	20723	7.67	80.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Theophylline-ethylenediamine hydrate
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20831-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Theophylline-ethylenediamine hydrate; Theophyllinum aethylendiaminum hydricum; Theophyllinum et ethylenediaminum hydricum

Special notes

When selecting the *Theophylline-ethylenediamine hydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Theophylline-ethylenediamine hydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Theophylline-eth...	12145301	20831	40	20120628
Caelo	Theophylline-eth...	12363708	20992	40	20130116
Caelo	Theophylline-eth...	13268609	21549	40	1412133

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Theophylline-ethylenediamine hydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Theophylline-ethylenediamine hydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Theophylline-ethylenediamine...	15380302	22589	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Theophylline-ethylenediamine hydrate*.

Supplier	Substance	Batch	Spectra
ACM / Phoenix	Theophylline-ethylenediamine...	KNC0896J14	1

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Theophylline-ethylenediamine hydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Theophylline-ethylenediamine hydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	37	3	81 308
Type C	0	1	0	56 000

The substance/substance group *Theophylline-ethylenediamine hydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	92.5000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20831	21549	5.39	63.16
20992	21549	3.99	62.70
21549	21549	0.00	62.36

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Thiamine chloride hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20566-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thiamine chloride hydrochloride; Aneurinum hydrochloricum; Thiamini hydrochloridum

Special notes

When selecting the *Thiamine chloride hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thiamine chloride hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Thiamine chlorid...	12D16-N02	20566	40	1402585
Caelo	Thiamine chlorid...	11371302	20570	40	20120131
Caelo	Thiamine chlorid...	14069502	21478	40	20140321
Caelo	Thiamine chlorid...	14069502	21511	40	8986
Euro OTC	Thiamine chlorid...	1211008-02	21647	40	20121122
Caelo	Thiamine chlorid...	160156	22477	40	20160316*
Euro OTC	Thiamine chlorid...	1612004	22919	40	20170117*

Validation samples

A total of 213 227 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 *Thiamine chloride hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 598 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 280 spectra of 9 reference samples from the substance/substance group *Thiamine chloride hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Thiamine chloride hydrochlor...	L11030345	20386	40
Euro OTC	Thiamine chloride hydrochlor...	1106001-01	20406	40
Euro OTC	Thiamine chloride hydrochlor...	1008026	20529	40
Euro OTC	Thiamine chloride hydrochlor...	1106001-01	20533	40
Caelo	Thiamine chloride hydrochlor...	10316406	20538	40
Caelo	Thiamine chloride hydrochlor...	14069502	21478 [†]	20
Caelo	Thiamine chloride hydrochlor...	14069502	21511 [†]	20
Euro OTC	Thiamine chloride hydrochlor...	1211008-02	21647 [†]	20
Caelo	Thiamine chloride hydrochlor...	160156	22477 [†]	20

- 81 068 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 28 spectra from 11 *Apo-Ident* customers from 22 batches from the substance/substance group *Thiamine chloride hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Thiamine chloride hydrochlor...	11371309	2
Caelo	Thiamine chloride hydrochlor...	4071402	1
Caelo	Thiamine chloride hydrochlor...	8121405	1
Fagron	Thiamine chloride hydrochlor...	10111401	1
Caelo	Thiamine chloride hydrochlor...	11061401	1
Caelo	Thiamine chloride hydrochlor...	12091407	1
Sanacorp	Thiamine chloride hydrochlor...	12340712	1
Caelo	Thiamine chloride hydrochlor...	13296610	4
Caelo	Thiamine chloride hydrochlor...	15199009	1
Fagron	Thiamine chloride hydrochlor...	13E22-No8	1
Caelo	Thiamine chloride hydrochlor...	15003201	1
Caelo	Thiamine chloride hydrochlor...	14069502	1
Fagron	Thiamine chloride hydrochlor...	190115006	1
Caelo	Thiamine chloride hydrochlor...	15199099	1
Finze	Thiamine chloride hydrochlor...	9216114	1
Euro OTC	Thiamine chloride hydrochlor...	1106001-01	1
Caelo	Thiamine chloride hydrochlor...	11371313	1
Caelo	Thiamine chloride hydrochlor...	11371319	3
Caelo	Thiamine chloride hydrochlor...		1
Caelo	Thiamine chloride hydrochlor...	3312A-01119	1
Euro OTC	Thiamine chloride hydrochlor...	1211008-01	1
Euro OTC	Thiamine chloride hydrochlor...	L1305038-01	1

- 55 973 spectra from 335 *Apo-Ident* customers from a total of 20 590 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thiamine chloride hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thiamine chloride hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	280	0	75 598
Type B	0	200	80	81 068
Type C	0	28	0	55 973

The substance/substance group *Thiamine chloride hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.8571 %)
Type B	100.0000 % (> 99.9853 %)	71.4286 % (> 70.3571 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 78.5714 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20566	20566	0.00	38.34
20570	22919	6.44	41.30
21478	21511	6.26	43.80
21511	21511	0.00	43.65
21647	20566	11.67	41.51
22477	22477	0.00	36.21
22919	22919	0.00	39.63

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Thymol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20003-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Thymol; Thymolum

Special notes

When selecting the *Thymol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Thymol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Thymol	82563169	20003	30	I 2009 000 265
Caelo	Thymol	14025805	21469	40	20140127
Euro OTC	Thymol	1312022-02	21639	40	20131219
Euro OTC	Thymol	1510004	21943	40	20151016*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 150 spectra of 4 reference samples from the substance/substance group *Thymol*. These samples are listed above in the [calibration samples](#) section.
- 75 728 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Thymol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Thymol	14025805	21469 [†]	20
Euro OTC	Thymol	1312022-02	21639 [†]	20
Euro OTC	Thymol	1510004	21943 [†]	20

- 81 288 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 60 spectra from 48 *Apo-Ident* customers from 37 batches from the substance/substance group *Thymol*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Thymol	2031503	1
Sanacorp	Thymol	9E14-N16	1
Caelo	Thymol	11178718	1
Caelo	Thymol	11178716	1
Sanacorp	Thymol	1135816	1
Caelo	Thymol	11358607	3
Caelo	Thymol	11358608	1
Phönix	Thymol	11358610	1
Caelo	Thymol	11358616	2
Caelo	Thymol	11358610	1
Fagron	Thymol	12B06-N11	2
Euro OTC	Thymol	1202028-01	1
Fagron	Thymol	12E30-N11	1
Fagron	Thymol	12H29-N02	3
Fagron	Thymol	12K01-N02	3
Noweda	Thymol	12k01-no2	1
Euro OTC	Thymol	1312022-01	1
Frey+Lau GmbH/Phönix	Thymol	1312022-01	1
Fagron	Thymol	12M29-N02	1
Gehe Kassel	Thymol	1312022-01	1
Caelo	Thymol	13147502	2
Caelo	Thymol	13288802	4
Caesar § Lorenz GmbH	Thymol	13288806	1
PHOENIX 26.03.2014	Thymol	14025802	2
Caelo	Thymol	14025802	2
Caelo	Thymol	14025805	1
Caelo	Thymol	14025809	2
Caelo	Thymol	14025815	2
Euro OTC	Thymol	1410007-01	3
Caelo	Thymol	14025816	1
Caelo	Thymol	14310601	1
Caelo	Thymol	14310605	1
Euro OTC	Thymol	1510004-01	1
Euro OTC	Thymol	1510004-02	1
Caelo	Thymol	15130101	1
Caelo	Thymol	15130106	1
Ebert & Jacobi 02.08...	Thymol	15362901	1
Caelo	Thymol	19061303	1
Caelo	Thymol	15362901	1
Euro OTC	Thymol	20151012-1	1
Fagron	Thymol	713575	1
ACM / Herba	Thymol	KNC1166J14	1

- 55 941 spectra from 335 *Apo-Ident* customers from a total of 20 574 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Thymol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Thymol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	150	0	75 728
Type B	0	60	0	81 288
Type C	0	60	0	55 941

The substance/substance group *Thymol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 90.0000 %)

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
20003	20003	0.00	47.45
21469	20003	4.45	47.18
21639	20003	7.67	48.34
21943	21943	0.00	41.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tobramycin sulfate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20951-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tobramycin sulfate; Tobramycin sulphate; Tobramycini sulfas; Tobramycinum sulfuricum

Special notes

When selecting the *Tobramycin sulfate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tobramycin sulfate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tobramycin sulfate	12G03-N03	20951	40	1404541
Euro OTC	Tobramycin sulfate	1301011-02	21624	40	1508071
Euro OTC	Tobramycin sulfate	1505015-01	21832	40	8963
Euro OTC	Tobramycin sulfate	1510035-01	22240	40	9202
Euro OTC	Tobramycin sulfate	1510035	22252	40	20151208*
Fagron	Tobramycin sulfate	15I17-B04-315697	22359	30	20150928
Audor	Tobramycin sulfate	AP15061047002T	22393	40	1608462

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Tobramycin sulfate*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 8 reference samples from the substance/substance group *Tobramycin sulfate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Tobramycin sulfate	1301011-02	21624 [†]	20
Euro OTC	Tobramycin sulfate	1505015-01	21832 [†]	20
Euro OTC	Tobramycin sulfate	1510035-01	22240 [†]	20
Euro OTC	Tobramycin sulfate	1510035	22252 [†]	20
Fagron	Tobramycin sulfate	15I17-B04-315697	22359 [†]	15
Euro OTC	Tobramycin sulfate	1505015-01	21832SI	60
Euro OTC	Tobramycin sulfate	1510035-01	22240SI	60
Euro OTC	Tobramycin sulfate	1510035	22252SI	60

- 81 073 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

provided by the customer regarding manufacturer and batch number.

- 6 spectra from 4 *Apo-Ident* customers from 6 batches from the substance/substance group *Tobramycin sulfate*.

Supplier	Substance	Batch	Spectra
PHOENIX 31.01.2014	Tobramycin sulfate	1202006-01	1
Fagron	Tobramycin sulfate	13H09-N09	1
Fagron	Tobramycin sulfate	15/17-B04-315697	1
Euro OTC	Tobramycin sulfate	1505015-01	1
Euro OCT/Noweda	Tobramycin sulfate	1510035-01	1
Euro OTC	Tobramycin sulfate	15I17-B04-315697	1

- 55 995 spectra from 335 *Apo-Ident* customers from a total of 20 605 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tobramycin sulfate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tobramycin sulfate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	199	76	81 073
Type C	0	5	1	55 995

The substance/substance group *Tobramycin sulfate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	72.3636 % (> 71.2727 %)
Type C	100.0000 % (> 99.8624 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20951	20951	0.00	14.33
21624	21624	0.00	15.98
21832	21832	0.00	23.22
22240	22240	0.00	47.01
22252	22252	0.00	22.44
22359	21832	8.24	25.48
22393	22393	0.00	17.25

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tosylchloramide sodium**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20133-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tosylchloramide sodium; Chloraminum; Tosylchloramidum natricum

Special notes

When selecting the *Tosylchloramide sodium* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tosylchloramide sodium*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tosylchloramide ...	09359512	20133	40	20091230
Caelo	Tosylchloramide ...	13103201	20864	40	20130424
Caelo	Tosylchloramide ...	13361602	21115	40	1407634

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tosylchloramide sodium*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 2 reference samples from the substance/substance group *Tosylchloramide sodium*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tosylchloramide sodium	13361606	21480	60
Caelo	Tosylchloramide sodium	162366	22773	40

- 81 248 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 71 spectra from 30 *Apo-Ident* customers from 39 batches from the substance/substance group *Tosylchloramide sodium*.

Supplier	Substance	Batch	Spectra
Caelo	Tosylchloramide sodium	13103206	5
Caelo	Tosylchloramide sodium	13103207	3
Caelo	Tosylchloramide sodium	13361606	4
Caelo	Tosylchloramide sodium	13103210	4
Caelo	Tosylchloramide sodium	13361607	5
Caelo	Tosylchloramide sodium	13361608	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Tosylchloramide sodium	14183505	1
Phoenix goettin	Tosylchloramide sodium	14183509	1
Fagron	Tosylchloramide sodium	14B27-B3-294701	1
Euro OTC	Tosylchloramide sodium	14B27-B03-29401	1
Caelo	Tosylchloramide sodium	15039603	2
Caelo	Tosylchloramide sodium	15370505	1
Caelo	Tosylchloramide sodium	15370501	1
Caelo	Tosylchloramide sodium	16236603	1
Fagron	Tosylchloramide sodium	181970-003	1
Caelo	Tosylchloramide sodium	71051187	2
Caelo	Tosylchloramide sodium	72215377	2
Caelo	Tosylchloramide sodium	11/07-N06	1
Caelo	Tosylchloramide sodium	11210803	1
Fagron	Tosylchloramide sodium	11L08-N04	1
Caelo	Tosylchloramide sodium	11116709	1
Fagron	Tosylchloramide sodium	11J07-N06	1
Fagron	Tosylchloramide sodium	11D19-N05	1
Fagron	Tosylchloramide sodium	12/22-B02-288834	1
Caelo	Tosylchloramide sodium	11116708	1
Caelo	Tosylchloramide sodium	12277005	3
Fagron	Tosylchloramide sodium	11L08-N04	1
Caelo	Tosylchloramide sodium	12323605	2
Caelo	Tosylchloramide sodium	12323601	1
Caelo	Tosylchloramide sodium	12323607	2
Synopharm am 10.09.2012	Tosylchloramide sodium	12323607	1
Caelo	Tosylchloramide sodium	12323606	1
Caelo	Tosylchloramide sodium	12323608	1
Caelo	Tosylchloramide sodium	12323609	2
Anzag	Tosylchloramide sodium	12H09-N01	1
Sanacorp	Tosylchloramide sodium	12H09-N01	1
Caelo	Tosylchloramide sodium	13103201	2
Caelo	Tosylchloramide sodium	13103202	1
PHOENIX am 22.01.2014	Tosylchloramide sodium	13103206	2
Fagron	Tosylchloramide sodium	Ch12H09-N01	2
PHOENIX am 12.06.2012	Tosylchloramide sodium	181970-0001	1
Fagron	Tosylchloramide sodium	12H09-N01	1
Caelo	Tosylchloramide sodium	1310206	1

- 55 930 spectra from 335 *Apo-Ident* customers from a total of 20 572 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tosylchloramide sodium* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tosylchloramide sodium* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	0	81 248
Type C	0	70	1	55 930

The substance/substance group *Tosylchloramide sodium* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8622 %)	98.5915 % (> 94.3662 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20133	21115	6.87	30.59
20864	21115	10.05	27.93
21115	21115	0.00	30.18

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tranexamic acid**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20397-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tranexamic acid; Acidum tranexamicum

Special notes

When selecting the *Tranexamic acid* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tranexamic acid*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tranexamic acid	11J11-N05	20397	40	AR-12-FG-010245-01
Fagron	Tranexamic acid	14C21-B08-292225	21654	40	20140331
Fagron	Tranexamic acid	14L15-B06-3000036	21727	40	AR-15-FG-008937-02

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tranexamic acid*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Tranexamic acid*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tranexamic acid	14C21-B08-292225	21654 [†]	20
Fagron	Tranexamic acid	14L15-B06-3000036	21727 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 5 spectra from 5 *Apo-Ident* customers from 5 batches from the substance/substance group *Tranexamic acid*.

Supplier	Substance	Batch	Spectra
Fagron	Tranexamic acid	15J29-B04	1
Fagron	Tranexamic acid	12D11-N02	1
Fagron	Tranexamic acid	15J29-B04-312372	1
Fagron	Tranexamic acid	13G24-N21	1
Caelo	Tranexamic acid	20110429	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*.

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tranexamic acid* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tranexamic acid* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	40	0	81 308
Type C	0	5	0	55 996

The substance/substance group *Tranexamic acid* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20397	20397	0.00	89.48
21654	20397	13.78	88.40
21727	21727	0.00	81.02

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tretinoin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20474-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tretinoin; Tretinoinum

Special notes

When selecting the *Tretinoin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tretinoin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Tretinoin	11284703	20474	40	AR-13-FG-001228-01
Euro OTC	Tretinoin	1402007-02	21747	40	1507085
Caelo	Tretinoin	15028403	21757	40	1507086
Caelo	Tretinoin	15239503	21878	20	20150717
Euro OTC	Tretinoin	1510007	21940	40	20151102*
Euro OTC	Tretinoin	1604059	22574	40	20160603*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tretinoin	15F01-B06-317884	22936	40	20150619
Euro OTC	Tretinoin	1402007-02	21747SI	40	1507085
Caelo	Tretinoin	15028403	21757SI	40	1507086
Caelo	Tretinoin	15239503	21878SI	40	20150717
Euro OTC	Tretinoin	1510007	21940SI	40	20151102*
Fagron	Tretinoin	15F01-B06-317884	22936SI	40	20150619

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 460 spectra of 12 reference samples from the substance/substance group *Tretinoin*. These samples are listed above in the [calibration samples](#) section.
- 75 418 spectra from a total of 1569 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 581 spectra of 18 reference samples from the substance/substance group *Tretinoin*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Tretinoin	9364503	20195	41
zu erfassen	Tretinoin	pending	20220	40
Fagron	Tretinoin	11A27-N01	20239	40
Euro OTC	Tretinoin	1402007-02	21747 [†]	20
Caelo	Tretinoin	15028403	21757 [†]	20
Caelo	Tretinoin	15239503	21878 [†]	40
Euro OTC	Tretinoin	1510007	21940 [†]	20
Caelo	Tretinoin	162915	22779	40
Caelo	Tretinoin	162171	22780	40
Euro OTC	Tretinoin	1612010	22911	40
Euro OTC	Tretinoin	1402007-02	21747SI [†]	20
Caelo	Tretinoin	15028403	21757SI [†]	20
Caelo	Tretinoin	15239503	21878SI [†]	20

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Tretinoin	1510007	21940SI [†]	20
Euro OTC	Tretinoin	1604059	22574SI	40
Caelo	Tretinoin	162915	22779SI	40
Caelo	Tretinoin	162171	22780SI	40
Euro OTC	Tretinoin	1612010	22911SI	40

- 80 767 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 280 spectra from 129 *Apo-Ident* customers from 109 batches from the substance/substance group *Tretinoin*.

Supplier	Substance	Batch	Spectra
Euro OTC	Tretinoin	12959AX20	1
EuRho/Sanacorp	Tretinoin	130402802	1
Euro OTC	Tretinoin	1304028-02	6
Caelo	Tretinoin	13278102	6
Caelo	Tretinoin	13308004	5
Sanacorp	Tretinoin	13308004	1
Caelo	Tretinoin	13B05-B02-287360	1
Fagron	Tretinoin	13B05-B02-287360	6
Euro OTC	Tretinoin	14020007-01	1
Fagron	Tretinoin	13D30-N14	2
Fagron	Tretinoin	13C11-N06	1
Fagron	Tretinoin	13D30N14	1
Fagron	Tretinoin	13B05-B02-287361	2
Euro OTC	Tretinoin	1402007	1
Euro OTC	Tretinoin	140200701	1
Euro OTC	Tretinoin	1402007-01	5
Euro OTC	Tretinoin	1402007-02	7
Euro OTC	Tretinoin	1402007-03	4
Phönix	Tretinoin	1402007-02	1
BASF	Tretinoin	1402007-03	1
Fagron	Tretinoin	14040504	1
Caelo	Tretinoin	14040504	5
Fagron	Tretinoin	14093505	1
Caelo	Tretinoin	14093502	4
Caelo	Tretinoin	14093503	2
Euro OTC	Tretinoin	14101602	1
Euro OTC	Tretinoin	1411016-01	9
Sanacorp	Tretinoin	1411016-01	1
Caelo	Tretinoin	1411016-01	1
Fagron	Tretinoin	1411016-01	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
Sanacorp	Tretinoin	1411016-02	1
Euro OTC	Tretinoin	1411016-02	7
Euro OTC	Tretinoin	141101602	1
Euro OTC	Tretinoin	141107602	1
Caelo	Tretinoin	14252702	3
Euro	Tretinoin	14111016-01	1
Caelo	Tretinoin	14252710	2
Fagron	Tretinoin	14D09-B04	1
Caelo	Tretinoin	14252706	1
Caelo	Tretinoin	14252801	2
Phönix	Tretinoin	14D09-B04	2
Fagron	Tretinoin	14D09-B04-293224	1
Phönix	Tretinoin	14D09-B04-293224	1
Fagron	Tretinoin	14D09-B04-293225	1
Fagron	Tretinoin	14D09-B04-293594	1
Fagron	Tretinoin	14D09-B04-295551	1
Caelo	Tretinoin	14L24-B01-303157	1
Fagron	Tretinoin	14L24-B01-303157	2
Caelo	Tretinoin	15078301	1
Caelo	Tretinoin	15078302	2
Anzag/Henry Lamotte	Tretinoin	15078303	1
Caelo	Tretinoin	1510007-01	1
Euro OTC	Tretinoin	1510007-01	6
Caelo	Tretinoin	15078305	1
Caelo	Tretinoin	151000701	1
Caelo	Tretinoin	15239501	1
Euro OTC	Tretinoin	1510007-02	6
Caelo	Tretinoin	15239502	3
Caelo	Tretinoin	15437303	1
Noweda	Tretinoin	15F01-B06-315491	1
Euro OTC	Tretinoin	1604059-01	3
Fagron	Tretinoin	15F01-B06-308722	1
Fagron	Tretinoin	15F01-B06-313216	1
Fagron	Tretinoin	15F01-B06-308856	1
Caelo	Tretinoin	16070001	1
Caelo	Tretinoin	16070002	2
Noweda	Tretinoin	1008021-02	1
gehe	Tretinoin	11225511	1
Euro OTC	Tretinoin	10429AX21	1
Caelo	Tretinoin	3041302	1
Caelo	Tretinoin	711212563	1
Euro OTC	Tretinoin	1109014-02	3
Euro OTC	Tretinoin	1008021-02	1
Caelo	Tretinoin	1109014-02	1
Phoenix am 19.06.2012	Tretinoin	11K01-N02	1
FARGON	Tretinoin	11a27-n01	1
Sanacorp	Tretinoin	12/06-N01	1
Fagron	Tretinoin	11K29-N01	1
Phönix 08.03.13	Tretinoin	11K29-N01	1
Caelo	Tretinoin	12023302	12
Noweda	Tretinoin	12023302	2
Caelo	Tretinoin	12102903	4
Caelo	Tretinoin	12023309	1
Caesar & Loretz GmbH, 4...	Tretinoin	12023302	1
Caelo	Tretinoin	12102902	1
Caelo	Tretinoin	12320205	5
Caelo	Tretinoin	12320303	1
Caelo	Tretinoin	12320207	2
Caelo	Tretinoin	12367101	2
Caelo	Tretinoin	12367103	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Tretinoin	12367104	1
Fagron	Tretinoin	12D05-N08	2
Caelo	Tretinoin	12D05-N08	1
Caelo	Tretinoin	12I06-N01	1
Großhandel	Tretinoin	12I06-N01	1
Fagron	Tretinoin	12I06-N01	3
Fagron	Tretinoin	12I06-N01	1
Euro OTC	Tretinoin	130102802	1
Euro OTC	Tretinoin	1304028-01	7
BASF/Phönix	Tretinoin	1304028-02	2
Caelo	Tretinoin	1304028-02	3
Euro OTC	Tretinoin	130402802	1
Euro OTC	Tretinoin	13041028-01	1
Caelo	Tretinoin	13195002	13
cealo	Tretinoin	13195002	1
Caelo	Tretinoin	13278101	1
Caelo	Tretinoin	13278104	3
Caelo	Tretinoin	13278105	2
Caelo	Tretinoin	13308003	1
Noweda	Tretinoin	13D30-N14	1
Euro OTC	Tretinoin	14110116-02	1
Caelo	Tretinoin	14093504	1
Fagron	Tretinoin	20120601	1
Caelo	Tretinoin	15078303	1
Caelo	Tretinoin	412051/4	1
Caelo	Tretinoin	20120601	1
Caelo	Tretinoin	5012I-02563	1
Caelo	Tretinoin	11k29-n01	1
Caelo	Tretinoin	16F14-B04	1
Caelo	Tretinoin	12320203	3
Caelo	Tretinoin	11225511	1
Phönix	Tretinoin	1109014-02	1
Phoenix	Tretinoin	12367103	1
Fagron	Tretinoin	13D30-N14-3365319091	1
Caelo	Tretinoin	11225506	2
Kehr	Tretinoin	1109014-01	1
Caelo	Tretinoin	13195008	2
Fagron	Tretinoin	14009-804	1
Phoenix	Tretinoin	15F01-B06-317884	1
Caelo	Tretinoin	11225504	1
Caesar & Loretz GmbH	Tretinoin	11225515	1
Caelo	Tretinoin	11284703	1
Caelo	Tretinoin	12102904	2
Caelo	Tretinoin	12320201	1
Caelo	Tretinoin	12320204	1
Caelo	Tretinoin	12320209	4
Caesar & Loretz GmbH	Tretinoin	12320211	1
Caelo	Tretinoin	12320301	1
Kehr	Tretinoin	12320301	1
Sanacorp	Tretinoin	12320302	1
Caelo	Tretinoin	131950002	1
Sanacorp	Tretinoin	13195002	1

- 55 721 spectra from 335 *Apo-Ident* customers from a total of 20 502 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#),

the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tretinoin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tretinoin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	460	0	75 418
Type B	0	581	0	80 767
Type C	0	216	64	55 721

The substance/substance group *Tretinoin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.6957 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.9673 %)
Type C	100.0000 % (> 99.8622 %)	77.1429 % (> 76.0714 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20474	20474	0.00	20.47
21747	21747	0.00	24.28
21757	21757	0.00	21.89
21878	21747	10.30	21.53
21940	21940	0.00	23.25
22574	22574	0.00	22.39
22936	21940	2.35	22.87

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Triamcinolon, micronized**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20564-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Triamcinolon, micronized; Triamcinolonum micronisatum

Special notes

When selecting the *Triamcinolon, micronized* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Triamcinolon, micronized*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Triamcinolon, mi...	12A03-N09	20564	40	1403253
Fagron	Triamcinolon, mi...	12A03-N09	20730	40	20120117
Fagron	Triamcinolon, mi...	12K07-N13	20936	80	AR-15-FG-003373-01
Caelo	Triamcinolon, mi...	15106905	22273	30	20150527
Fagron	Triamcinolon, mi...	14B13-B30-316101	22840	40	20140311

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 230 spectra of 5 reference samples from the substance/substance group *Triamcinolon, micronized*. These samples are listed above in the [calibration samples](#) section.
- 75 648 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 55 spectra of 2 reference samples from the substance/substance group *Triamcinolon, micronized*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Triamcinolon, micronized	15106905	22273 [†]	15
Caelo	Triamcinolon, micronized	15106905	22605	40

- 81 293 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 22 spectra from 18 *Apo-Ident* customers from 14 batches from the substance/substance group *Triamcinolon, micronized*.

Supplier	Substance	Batch	Spectra
Sanacorp	Triamcinolon, micronized	100/AKD6	1
Caelo	Triamcinolon, micronized	12295207	1

continued on the next page

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Triamcinolon, micronized	12295210	1
Fagron	Triamcinolon, micronized	12F01-N19	4
Fagron	Triamcinolon, micronized	13C26-N04	2
Fagron	Triamcinolon, micronized	13D30-N15	2
Caelo	Triamcinolon, micronized	13J07-N08	2
Noweda 24.08.2015	Triamcinolon, micronized	14B13-B30-293474	1
Fagron	Triamcinolon, micronized	14B13-B30-293474	1
Phönix	Triamcinolon, micronized	NS0608M	1
Fagron	Triamcinolon, micronized	11D28-N04	1
Fagron	Triamcinolon, micronized	11G26-N04	1
Fagron	Triamcinolon, micronized	12D02-N14	1
Fagron	Triamcinolon, micronized	12A03-N09	2
Caelo	Triamcinolon, micronized	12146612	1

- 55 979 spectra from 335 *Apo-Ident* customers from a total of 20 599 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Triamcinolon, micronized* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Triamcinolon, micronized* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	220	10	75 648
Type B	0	55	0	81 293
Type C	0	18	4	55 979

The substance/substance group *Triamcinolon, micronized* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	95.6522 % (> 94.3478 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 89.0909 %)
Type C	100.0000 % (> 99.8622 %)	81.8182 % (> 68.1818 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20564	20564	0.00	34.46
20730	20936	20.09	44.66
20936	20936	0.00	47.54
22273	20936	3.26	47.61
22840	20936	10.69	44.82

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group	Triamcinolone acetonide
Substance class	APIs & excipients, solid
Report date	12/04/2017
Report number	20765-2017-04-12
Executing company	HiperScan GmbH Weißeritzstraße 3 01067 Dresden Germany

Relevant substance names

Triamcinolone acetonide; Triamcinoloni acetonidum; Triamcinolonum acetonatum

Special notes

When selecting the *Triamcinolone acetonide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
 Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
 AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Triamcinolone acetonide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Triamcinolone ac...	12E15-N03	20765	40	1412051
Euro OTC	Triamcinolone ac...	1303001-02	20910	40	20130815
Caelo	Triamcinolone ac...	13256607	21061	80	AR-15-FG-003755-01
Euro OTC	Triamcinolone ac...	1211013-02	21072	30	20130417
Caelo	Triamcinolone ac...	13379921	21587	40	1503634
Euro OTC	Triamcinolone ac...	1508008	21883	40	20150902*

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Triamcinolone ac...	15C19-B06-308572	21962	40	20150402
Euro OTC	Triamcinolone ac...	1601021	22313	30	20160119*
Euro OTC	Triamcinolone ac...	1605010	22572	40	20160531*
Euro OTC	Triamcinolone ac...	1608005	22752	40	20160906*
Euro OTC	Triamcinolone ac...	1605010	22572SI	25	20160531*
Euro OTC	Triamcinolone ac...	1608005	22752SI	22	20160906*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 467 spectra of 12 reference samples from the substance/substance group *Triamcinolone acetone*. These samples are listed above in the [calibration samples](#) section.
- 75 411 spectra from a total of 1566 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 413 spectra of 14 reference samples from the substance/substance group *Triamcinolone acetone*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Triamcinolone acetone	80890079	20007	20
Fagron	Triamcinolone acetone	12E15-N03	20765 [†]	10
Caelo	Triamcinolone acetone	12301505	20769	50
Fagron	Triamcinolone acetone	13C13-N20	21043	40
Caelo	Triamcinolone acetone	13379921	21587 [†]	20
Euro OTC	Triamcinolone acetone	1508008	21883 [†]	20
Fagron	Triamcinolone acetone	15C19-B06-308572	21962 [†]	20
Euro OTC	Triamcinolone acetone	1601021	22313 [†]	15
Caelo	Triamcinolone acetone	160945	22473	60
Euro OTC	Triamcinolone acetone	1612014	22978	40
Euro OTC	Triamcinolone acetone	1508008	21883SI	30
Fagron	Triamcinolone acetone	15C19-B06-308572	21962SI	19
Caelo	Triamcinolone acetone	160945	22473SI	40
Euro OTC	Triamcinolone acetone	1612014	22978SI	29

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

- 80 935 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1010 spectra from 242 *Apo-Ident* customers from 282 batches from the substance/substance group *Triamcinolone acetonide*.

Supplier	Substance	Batch	Spectra
Euro OTC	Triamcinolone acetonide	3051402	1
Fagron	Triamcinolone acetonide	4111408	1
Caelo	Triamcinolone acetonide	6051401	1
Caelo	Triamcinolone acetonide	100/AKD2	1
Caelo	Triamcinolone acetonide	12031601	1
Sanacorp	Triamcinolone acetonide	100/AKD4	1
Fagron	Triamcinolone acetonide	7041501	1
Euro OTC	Triamcinolone acetonide	1211013-01	9
Caelo	Triamcinolone acetonide	1206008-01	1
Euro OTC	Triamcinolone acetonide	1211013-02	13
Caelo	Triamcinolone acetonide	12173703	1
Fagron	Triamcinolone acetonide	13/26-N11	5
Euro OTC	Triamcinolone acetonide	1307043-01	12
Euro OTC	Triamcinolone acetonide	1307043-02	11
Caelo	Triamcinolone acetonide	13124804	15
Caelo	Triamcinolone acetonide	13124801	6
EuRho/Phönix	Triamcinolone acetonide	1307043-02	1
Caelo	Triamcinolone acetonide	13124805	8
Caelo	Triamcinolone acetonide	13124808	12
Caelo	Triamcinolone acetonide	13124807	6
Gepepharm/Noweda	Triamcinolone acetonide	13124808	1
Caelo	Triamcinolone acetonide	13124809	2
Caelo	Triamcinolone acetonide	13124811	1
Caelo	Triamcinolone acetonide	13124810	3
Caelo	Triamcinolone acetonide	13256603	1
Caelo	Triamcinolone acetonide	13256604	5
Caelo	Triamcinolone acetonide	13256606	1
Caelo	Triamcinolone acetonide	13256608	2
Sanacorp	Triamcinolone acetonide	1326N11	1
Caelo	Triamcinolone acetonide	13379904	5
Phönix	Triamcinolone acetonide	13379902	1
Caelo	Triamcinolone acetonide	13379903	2
Caelo	Triamcinolone acetonide	13379902	1
Caelo	Triamcinolone acetonide	13379905	8
Sanacorp	Triamcinolone acetonide	13379905	1
Martinus-Apotheke	Triamcinolone acetonide	13379905	1
Caelo	Triamcinolone acetonide	13379906	6
Caesar & Loretz GmbH Hi...	Triamcinolone acetonide	13379905	1
Caelo	Triamcinolone acetonide	13379911	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
Caelo	Triamcinolone acetonide	13379912	6
Euro OTC	Triamcinolone acetonide	13379912	2
Caelo	Triamcinolone acetonide	13379913	4
Caelo	Triamcinolone acetonide	13379914	6
Caelo	Triamcinolone acetonide	1355101	1
Caelo	Triamcinolone acetonide	13379919	1
Caelo	Triamcinolone acetonide	13379922	1
Fagron	Triamcinolone acetonide	13c13-n20	2
Fagron	Triamcinolone acetonide	13C13-N20	16
Fagron	Triamcinolone acetonide	13E15-N03	48
Fagron	Triamcinolone acetonide	13E15N03	3
Phönix	Triamcinolone acetonide	13E15-N03	1
Fagron	Triamcinolone acetonide	13I26-N11	14
Caelo	Triamcinolone acetonide	13I26-N11	1
Fagron	Triamcinolone acetonide	13I26N11	1
Fagron	Triamcinolone acetonide	13I26-N26	1
Fagron	Triamcinolone acetonide	13K14-B04	4
Fagron	Triamcinolone acetonide	13K14-B04-289032	1
Fagron	Triamcinolone acetonide	13K14-b04	1
Fagron	Triamcinolone acetonide	13K14-B04-289033	8
Caelo	Triamcinolone acetonide	13K14-B04-289033	2
Fagron	Triamcinolone acetonide	13K15-B31	8
Fagron	Triamcinolone acetonide	13K15-B31-289031	3
Fagron	Triamcinolone acetonide	13K15-B31-289025	1
Fagron	Triamcinolone acetonide	13K15-B31-289027	4
Phönix	Triamcinolone acetonide	13K15-B31-289027	1
Noweda	Triamcinolone acetonide	13K15-B31-289029	1
Fagron	Triamcinolone acetonide	13K15B31289029	1
Fagron	Triamcinolone acetonide	13K15-B31-289029	4
Apomix/Phönix	Triamcinolone acetonide	13k15-b31-289029	2
Caelo	Triamcinolone acetonide	13K15-B31-289029	1
Fagron	Triamcinolone acetonide	13k15-b31-289030	1
Fargon	Triamcinolone acetonide	13K15-B31-289030	1
Caelo	Triamcinolone acetonide	13K15-B31-289031	1
Phoenix	Triamcinolone acetonide	13I26-N11	2
Fagron	Triamcinolone acetonide	13K15B31289031	1
Euro OTC	Triamcinolone acetonide	14030009-01	2
Euro OTC	Triamcinolone acetonide	14030009-02	1
Euro OTC	Triamcinolone acetonide	1403009-01	7
euroct/gehe	Triamcinolone acetonide	1403009	1
Phönix	Triamcinolone acetonide	1403009-01	1
Euro OTC	Triamcinolone acetonide	1403009-02	12
euroct/gehe	Triamcinolone acetonide	1403009-02	1
EuRho	Triamcinolone acetonide	1403009-02	1
EuRho/Phoenix	Triamcinolone acetonide	1403009-02	1
Euro OTC	Triamcinolone acetonide	1407044-01	7
EuRho/Phönix	Triamcinolone acetonide	1407044-01	1
Newchem/Kehr	Triamcinolone acetonide	1407044-01	1
Phönix	Triamcinolone acetonide	1407044-01	1
Bombastus	Triamcinolone acetonide	140704401	1
Fagron	Triamcinolone acetonide	1407044-01	1
Euro OTC	Triamcinolone acetonide	1407044-02	10
Euro OTC	Triamcinolone acetonide	14120130	1
Euro OTC	Triamcinolone acetonide	1412013-01	10
Euro OTC	Triamcinolone acetonide	141201301	1
Euro OTC	Triamcinolone acetonide	1412013-02	5
Euro OTC	Triamcinolone acetonide	141201302	2
Caelo	Triamcinolone acetonide	14188303	3
Euro OTC	Triamcinolone acetonide	14188304	1
Caelo	Triamcinolone acetonide	14188304	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetonide	14355101	10
Caelo	Triamcinolone acetonide	14255104	1
Berkel AHK	Triamcinolone acetonide	14355101	3
AHD 06.03.15 9,47	Triamcinolone acetonide	14355102	2
Caelo	Triamcinolone acetonide	14355102	11
Caelo	Triamcinolone acetonide	14355103	7
Noweda	Triamcinolone acetonide	14355103	1
Caelo	Triamcinolone acetonide	14355104	3
Fagron	Triamcinolone acetonide	14355104	1
Caelo	Triamcinolone acetonide	14355702	11
Caelo	Triamcinolone acetonide	14355703	2
Caelo	Triamcinolone acetonide	14355704	1
Caelo	Triamcinolone acetonide	14355706	1
Caelo	Triamcinolone acetonide	14355708	5
Noweda	Triamcinolone acetonide	14355708	1
Fagron	Triamcinolone acetonide	14355709	1
Phoenix	Triamcinolone acetonide	14355709	1
Caelo	Triamcinolone acetonide	14355711	4
Phönix Gotha	Triamcinolone acetonide	14355711	1
AHD	Triamcinolone acetonide	14355711	1
Caelo	Triamcinolone acetonide	14355712	1
Fagron	Triamcinolone acetonide	14F30-B01	2
Fagron	Triamcinolone acetonide	14F30B01	1
Fagron	Triamcinolone acetonide	14F30-B01-296287	1
Fagron	Triamcinolone acetonide	14G23-B07-297618	1
Fagron	Triamcinolone acetonide	14G23-B07	1
Fagron	Triamcinolone acetonide	14G23-B07-297619	1
Fagron	Triamcinolone acetonide	14G23-B07-297620	3
Fagron	Triamcinolone acetonide	14k14-B05-302887	1
Fagron	Triamcinolone acetonide	14K14-B05-302887	1
Euro OTC	Triamcinolone acetonide	1504007-01	9
NEWCHEM / Sanacorp	Triamcinolone acetonide	1504007-01	1
Caelo	Triamcinolone acetonide	1504007-01	1
Euro OTC	Triamcinolone acetonide	1504007-02	8
Euro OTC	Triamcinolone acetonide	1508008-01	6
Euro OTC	Triamcinolone acetonide	150800802	2
Euro OTC	Triamcinolone acetonide	1508008-02	6
Caelo	Triamcinolone acetonide	1508008-02	1
Caelo	Triamcinolone acetonide	1514Q2516	1
Caelo	Triamcinolone acetonide	15233901	10
Farmabios S.p.A./Caesar...	Triamcinolone acetonide	15233901	1
Caelo	Triamcinolone acetonide	15233902	12
AHD/Hedinger	Triamcinolone acetonide	15233902	1
Noweda	Triamcinolone acetonide	15233902	1
Caelo	Triamcinolone acetonide	15233903	9
Noweda	Triamcinolone acetonide	15233903	1
Euro OTC	Triamcinolone acetonide	15233904	1
Caelo	Triamcinolone acetonide	15233904	7
Caelo	Triamcinolone acetonide	15233905	4
Caelo	Triamcinolone acetonide	15233906	5
Caelo	Triamcinolone acetonide	15233908	2
Euro OTC	Triamcinolone acetonide	15233906	1
Caelo	Triamcinolone acetonide	15430102	1
Euro OTC	Triamcinolone acetonide	15404007-01	1
Caelo	Triamcinolone acetonide	15430101	1
Gehe	Triamcinolone acetonide	15430102	1
Caelo	Triamcinolone acetonide	15430105	5
Caelo	Triamcinolone acetonide	15430106	2
Caelo	Triamcinolone acetonide	15430108	2
Caelo	Triamcinolone acetonide	15430107	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Newchem S.p.A./Caesar &...	Triamcinolone acetonide	1543015	1
Fagron	Triamcinolone acetonide	15B02-B03	3
Fagron	Triamcinolone acetonide	15B02-B03-303827	1
Fagron	Triamcinolone acetonide	15B02-B03-303828	3
Fagron	Triamcinolone acetonide	15B02-B03-303830	4
Fagron	Triamcinolone acetonide	15C19-B06-308571	1
Fagron	Triamcinolone acetonide	15C19-B06-308572	4
Caelo	Triamcinolone acetonide	15C19-B06-308571	1
Fagron	Triamcinolone acetonide	15C19-B06-308573	3
Fagron	Triamcinolone acetonide	15C19-B06-309194	1
Fagron	Triamcinolone acetonide	15G31-B07	1
Fagron	Triamcinolone acetonide	15G31B07	1
Fagron	Triamcinolone acetonide	15g31-b07-314046	1
Fagron	Triamcinolone acetonide	15G31-B07-313597	2
Fagron	Triamcinolone acetonide	15G31-B07-313596	3
Fagron	Triamcinolone acetonide	15G31-B07-314045	2
Caelo	Triamcinolone acetonide	15G31-B07-313597	1
Caelo	Triamcinolone acetonide	15L21-B03-316123	1
Euro OTC	Triamcinolone acetonide	15L21-B03-316123	2
Fagron	Triamcinolone acetonide	15L21-B03-318663	1
Euro OTC	Triamcinolone acetonide	1601021-01	8
EuRho	Triamcinolone acetonide	1601021-01	1
Caelo	Triamcinolone acetonide	15L21-B03-318663	1
Caelo	Triamcinolone acetonide	160102101	1
Euro OTC	Triamcinolone acetonide	1605010-01	5
Caelo	Triamcinolone acetonide	1605010-01	1
Euro OTC	Triamcinolone acetonide	1608005-01	3
Caelo	Triamcinolone acetonide	16092504	4
Calo/Sanacorp	Triamcinolone acetonide	16092504	1
Caelo	Triamcinolone acetonide	16094501	4
Caelo	Triamcinolone acetonide	16094512	1
Fagron	Triamcinolone acetonide	16B04-B07-318664	1
Fagron	Triamcinolone acetonide	16B04-B07	1
Euro OTC	Triamcinolone acetonide	26081405	1
Euro OTC	Triamcinolone acetonide	17061406	1
Fagron	Triamcinolone acetonide	289027	1
Euro OTC	Triamcinolone acetonide	29011503	1
Euro OTC	Triamcinolone acetonide	31101414	1
euro/ Anzag	Triamcinolone acetonide	3315102516	1
Euro OTC	Triamcinolone acetonide	29081501	1
Fagron	Triamcinolone acetonide	700124-0004	1
Caelo	Triamcinolone acetonide	5430105	1
Audor Pharma	Triamcinolone acetonide	APB0544/112020T	1
Euro OTC	Triamcinolone acetonide	APB0544/112020T	1
Audor Pharma	Triamcinolone acetonide	APU0544/31524T	1
AUDOER/ Alliance Health...	Triamcinolone acetonide	APB0544/112020T	1
Audor Pharma	Triamcinolone acetonide	APU0544/315240T	1
Anzag	Triamcinolone acetonide	APB0544/112020T	1
Fagron	Triamcinolone acetonide	NT1430M	1
Oberlinden Apotheke	Triamcinolone acetonide	B0544/114010	1
Fagron	Triamcinolone acetonide	NT077oM	1
Fagron	Triamcinolone acetonide	NT1094M	1
NEWCHEM S.P.A.	Triamcinolone acetonide	NV0994M	1
Fagron	Triamcinolone acetonide	NV0262M	2
Fagron	Triamcinolone acetonide	Nw0635M	1
Oberlinden-Apotheke	Triamcinolone acetonide	U0544/1	1
Eigen/Defektur	Triamcinolone acetonide	U0544/113530	1
Audor Pharma	Triamcinolone acetonide	U0544/315240T	1
Caelo	Triamcinolone acetonide	1811211	1
Caelo	Triamcinolone acetonide	3041206	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Triamcinolone acetonide	5121302	1
Fagron	Triamcinolone acetonide	5061303	1
Fagron	Triamcinolone acetonide	5061205	1
Fagron	Triamcinolone acetonide	7H30-N03	1
Euro OTC	Triamcinolone acetonide	80616-5	1
Fagron	Triamcinolone acetonide	9041305	1
Caelo	Triamcinolone acetonide	9081305	1
Euro OTC	Triamcinolone acetonide	1013I-02516	1
Caelo	Triamcinolone acetonide	9364429	2
Caelo	Triamcinolone acetonide	10220311	1
Caelo	Triamcinolone acetonide	10220332	1
Caelo	Triamcinolone acetonide	10220340	2
Caelo	Triamcinolone acetonide	10220341	1
Caelo	Triamcinolone acetonide	10220342	1
Anzag, 24.10.2012	Triamcinolone acetonide	1110004-01	1
Euro OTC	Triamcinolone acetonide	1110004-01	1
Caelo	Triamcinolone acetonide	1107212516	1
Euro OTC	Triamcinolone acetonide	1110005-01	3
Caelo	Triamcinolone acetonide	1110005-01	1
Euro OTC	Triamcinolone acetonide	111005-01	1
Fagron	Triamcinolone acetonide	11101208	1
Euro OTC	Triamcinolone acetonide	1112023-01	3
Euro OTC	Triamcinolone acetonide	1112023-02	9
Noweda	Triamcinolone acetonide	1112023-02	1
Caesar&loretz,Phoenix	Triamcinolone acetonide	11267705	1
Caelo	Triamcinolone acetonide	11267704	1
Caelo	Triamcinolone acetonide	11267705	1
Caelo	Triamcinolone acetonide	11267706	1
Caelo	Triamcinolone acetonide	11267707	4
Caelo	Triamcinolone acetonide	11267710	2
Phönix Gotha	Triamcinolone acetonide	11267711	1
Caelo	Triamcinolone acetonide	11267714	1
Caelo	Triamcinolone acetonide	11267711	1
anzag am 29.06.2012	Triamcinolone acetonide	11267720	1
Caelo	Triamcinolone acetonide	11267720	1
Caelo	Triamcinolone acetonide	11267721	4
Gehe	Triamcinolone acetonide	11267721	1
Fagron	Triamcinolone acetonide	11K11-N10	5
Caelo	Triamcinolone acetonide	11K11-N10	1
Fagron	Triamcinolone acetonide	11B22-N05	1
Gehe	Triamcinolone acetonide	12/10-N09	2
Fagron	Triamcinolone acetonide	12/10-N09	5
Caelo	Triamcinolone acetonide	12/10-N09	3
Caelo	Triamcinolone acetonide	1201506	1
Euro OTC	Triamcinolone acetonide	1206008-01	5
Europharm/Otto	Triamcinolone acetonide	1206008-01	1
Fagron	Triamcinolone acetonide	120600801	1
Euro OTC	Triamcinolone acetonide	1209040-01	4
Caelo	Triamcinolone acetonide	1209040-01	1
Euro OTC	Triamcinolone acetonide	1209040-02	4
Gehe/Phönix	Triamcinolone acetonide	1209040-02	1
Europharm/Otto	Triamcinolone acetonide	1209040-02	1
Caelo	Triamcinolone acetonide	120904002	1
Caelo	Triamcinolone acetonide	1210-n09	1
Caelo	Triamcinolone acetonide	1211013-01	1
Europharm/Sanacorp	Triamcinolone acetonide	1211013-01	3
Gehe	Triamcinolone acetonide	1211013-01	2
EuRho/Phönix	Triamcinolone acetonide	1211013-01	1
GEHE	Triamcinolone acetonide	1211013-02	1
Noweda/ NEWCHEM	Triamcinolone acetonide	1211013-02	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
A.H. 07.05.13 ek: 7,25EUR	Triamcinolone acetonide	1211013-02	1
Caelo	Triamcinolone acetonide	1217307	1
euro	Triamcinolone acetonide	1211013-02	1
Caelo	Triamcinolone acetonide	12173701	8
Caesar&loretz,Phoenix	Triamcinolone acetonide	12173703	1
Caelo	Triamcinolone acetonide	12173704	1
Caelo	Triamcinolone acetonide	12173705	6
Fagron	Triamcinolone acetonide	12173705	1
Caelo	Triamcinolone acetonide	12173707	6
Phönix 28.03.2013	Triamcinolone acetonide	12173707	1
Caelo	Triamcinolone acetonide	12173710	5
Gehe	Triamcinolone acetonide	122301508	1
Caelo	Triamcinolone acetonide	12301501	4
Caesar&loretz,Phoenix	Triamcinolone acetonide	12301502	1
Caelo	Triamcinolone acetonide	12301503	1
Caelo	Triamcinolone acetonide	12301504	3
Fagron	Triamcinolone acetonide	12301503	1
Caelo	Triamcinolone acetonide	12301506	1
Noweda	Triamcinolone acetonide	12301506	1
Caelo	Triamcinolone acetonide	12301507	6
Euro OTC	Triamcinolone acetonide	12301507	1
Phoenix 11.03.2013	Triamcinolone acetonide	12301508	1
Caelo	Triamcinolone acetonide	12301508	4
Caelo	Triamcinolone acetonide	12301509	5
Caelo	Triamcinolone acetonide	12301510	4
Caelo	Triamcinolone acetonide	12301515	13
Caelo	Triamcinolone acetonide	12301518	4
Ph.Eur.7,0	Triamcinolone acetonide	12301518	1
Otto Fischar	Triamcinolone acetonide	12301517	1
Noveda	Triamcinolone acetonide	12301518	1
Kehr	Triamcinolone acetonide	1267708	1
Fagron	Triamcinolone acetonide	12B08-N01	7
Fagron	Triamcinolone acetonide	12B08N01	1
Fagron	Triamcinolone acetonide	12E15/N03	1
Fagron	Triamcinolone acetonide	12E15-N03	25
Gehe	Triamcinolone acetonide	12E15-N03	2
Großhandel	Triamcinolone acetonide	12E15-N03	1
Noweda	Triamcinolone acetonide	12E15-N03	1
Caelo	Triamcinolone acetonide	12E15-N03	2
Phönix	Triamcinolone acetonide	12E15-N03	1
Euro OTC	Triamcinolone acetonide	12G6008-01	1
Fagron	Triamcinolone acetonide	12I10-N09	6
Hirsch	Triamcinolone acetonide	12I10-N09	2
Fagron	Triamcinolone acetonide	12I10-N09	2
Fagron	Triamcinolone acetonide	13021408	1
Euro OTC	Triamcinolone acetonide	13030001-01	1
Euro OTC	Triamcinolone acetonide	1303001-01	5
Euro OTC	Triamcinolone acetonide		1
Euro OTC	Triamcinolone acetonide	1303001-02	6
Caelo	Triamcinolone acetonide	1303001-02	2
Gehe	Triamcinolone acetonide	1303001-02	1
Anzag	Triamcinolone acetonide	1303001-02	1
Newchem	Triamcinolone acetonide	1303001-02	1
Fagron	Triamcinolone acetonide	13121201	1
Euro OTC	Triamcinolone acetonide	1307043-03	1
Caelo	Triamcinolone acetonide	1312407	1
Caelo	Triamcinolone acetonide	13124803	4
phönix	Triamcinolone acetonide	13124803	1
Gehe	Triamcinolone acetonide	13124803	1
Gehe	Triamcinolone acetonide	13124805	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Triamcinolone acetone	13124806	3
Sanacorp	Triamcinolone acetone	13124807	2
Caesar & Loretz GmbH Hi...	Triamcinolone acetone	13124807	1
noweda	Triamcinolone acetone	13256604	1
Caelo	Triamcinolone acetone	13256607	3
fargon	Triamcinolone acetone	13C13-N20	1
Fagron	Triamcinolone acetone	13C13-20	1
Alliance Healthcare	Triamcinolone acetone	13C13-N20	2
Apotheke Mildenau	Triamcinolone acetone	13C13-N20	1
Caelo	Triamcinolone acetone	13C13-N20	2
Caelo	Triamcinolone acetone	13E15-N03	1
Gehe	Triamcinolone acetone	13E15-N03	2
Sanacorp	Triamcinolone acetone	13E15-N03	1
Fagron	Triamcinolone acetone	13E15-No3	1
Großhandel	Triamcinolone acetone	13E15-N03	1
	Triamcinolone acetone	1403009-01	1
Phönix	Triamcinolone acetone	14355703	1
Fagron	Triamcinolone acetone	14K24N-N01	1
Euro OTC	Triamcinolone acetone	150400701	1
apoident	Triamcinolone acetone	1508008-01	1
Fagron	Triamcinolone acetone	16011407	1
Caelo	Triamcinolone acetone	1601312516	1
Fagron	Triamcinolone acetone	20031302	1
Caelo	Triamcinolone acetone	1802212516	1
Euro OTC	Triamcinolone acetone	20130912-5	1
Fagron	Triamcinolone acetone		1
Caelo	Triamcinolone acetone	2513M02516	1
Fagron	Triamcinolone acetone	3212U-02516(NP)	1
Fagron	Triamcinolone acetone	411082-1-P	1
Caelo	Triamcinolone acetone	93/AD1	1
Caelo	Triamcinolone acetone	4613E2516	1
Gehe	Triamcinolone acetone	700124-0007	1
Caelo	Triamcinolone acetone	95/AKD34	1
Audor Pharma	Triamcinolone acetone	APB0544/11101	2
Audor Pharma	Triamcinolone acetone	APB0544/111010T	3
Fagron	Triamcinolone acetone	C22H25CIN209	1
Europharm/Otto	Triamcinolone acetone	B0544/111040	2
Caelo	Triamcinolone acetone		1
Caelo	Triamcinolone acetone	Ch-B11267704	1
Euro OTC	Triamcinolone acetone	B0544/111404	1
Caelo	Triamcinolone acetone	NS0571M	1
Fagron	Triamcinolone acetone	NS0571M	5
Fagron	Triamcinolone acetone	NS0996M	2
Klenk	Triamcinolone acetone	NS1680M	1
Fagron	Triamcinolone acetone	NS2571M	1
Fagron	Triamcinolone acetone	NS0571M	1
Euro OTC	Triamcinolone acetone	NV0635M	1
Euro OTC	Triamcinolone acetone	NV2998M	1
Oberlinden- Apotheke	Triamcinolone acetone	U0544/113530	1
Caelo	Triamcinolone acetone	9364422	1
Herbasinica	Triamcinolone acetone	1110005-01	1
Fagron	Triamcinolone acetone	11N11-N10	1
Fagron	Triamcinolone acetone	1210-N09	1
Euro OTC	Triamcinolone acetone	130704301	1
A.H.D.	Triamcinolone acetone	12301508	1

- 54 991 spectra from 335 *Apo-Ident* customers from a total of 20 332 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Triamcinolone acetonide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Triamcinolone acetonide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	467	0	75 411
Type B	0	413	0	80 935
Type C	0	979	31	54 991

The substance/substance group *Triamcinolone acetonide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.7152 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.5472 %)
Type C	100.0000 % (> 99.8622 %)	96.9307 % (> 96.6337 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20765	20765	0.00	9.45
20910	21061	4.27	6.90
21061	21061	0.00	9.28
21072	21061	1.70	11.09
21587	21587	0.00	7.03
21883	21883	0.00	8.29
21962	21587	4.22	9.34
22313	22313	0.00	9.81
22572	22572	0.00	17.10
22752	22752	0.00	6.01

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Triclosan**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20005-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Triclosan; Triclosanum

Special notes

When selecting the *Triclosan* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Triclosan*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Triclosan	83452249	20005	30	I 2009 000 266
Caelo	Triclosan	13391808	21509	40	20131211
Caelo	Triclosan	14121209	21591	40	20140718
Euro OTC	Triclosan	1406032-01	21615	40	20140710
Euro OTC	Triclosan	1507041	21856	40	20150804*
Euro OTC	Triclosan	1510045	22227	40	20150511*
Euro OTC	Triclosan	1602003	22373	30	20160204*
Euro OTC	Triclosan	1701032	22987	40	20170207*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 300 spectra of 8 reference samples from the substance/substance group *Triclosan*. These samples are listed above in the [calibration samples](#) section.
- 75 578 spectra from a total of 1568 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 256 spectra of 10 reference samples from the substance/substance group *Triclosan*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Triclosan	83452249	20005 [†]	1
Caelo	Triclosan	13391808	21509 [†]	20
Caelo	Triclosan	14121209	21591 [†]	20
Euro OTC	Triclosan	1406032-01	21615 [†]	20
Euro OTC	Triclosan	1507041	21856 [†]	20
Euro OTC	Triclosan	1510045	22227 [†]	20
Euro OTC	Triclosan	1602003	22373 [†]	15
Caelo	Triclosan	160846	22453	60
Euro OTC	Triclosan	1607002	22674	40
Caelo	Triclosan	162808	22775	40

- 81 092 spectra from a total of 1937 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1312 spectra from 260 *Apo-Ident* customers from 289 batches from the substance/substance group *Triclosan*.

Supplier	Substance	Batch	Spectra
Fagron	Triclosan	12L06-N01	34
Gehe	Triclosan	4394083	1
Fagron	Triclosan	4394083	2
Fagron	Triclosan	434083	1
Fagron	Triclosan	4394403	1
Euro OTC	Triclosan	4486611	2
Anzag/	Triclosan	5846205	1
BASF Chem trade GmbH/Ph...	Triclosan	5846205	1
Fagron	Triclosan	5846205	2
Fagron	Triclosan	9000383	2
BASF Grenzach/Noweda	Triclosan	5900346	1
Fagron	Triclosan	10006226	2
Fagron	Triclosan	10666066	1
Fagron	Triclosan	106666066	1
Caelo	Triclosan	11777748	1
BASF Grenzach GmbH/Phönix	Triclosan	10006226	1
Fagron	Triclosan	11777748	2
Rondell Apotheke	Triclosan	11965460	1
Euro OTC	Triclosan	12276023	1
Caelo	Triclosan	3041408	1
Caelo	Triclosan	8081401	1
Fagron	Triclosan	52/942	1
Euro OTC	Triclosan	1006024-01	1
Fagron	Triclosan		2
Caelo	Triclosan	10290812	1
Fagron	Triclosan	10J18-N01	2
Gehe	Triclosan	11/19-N11	1
EuRho	Triclosan	1107030-01	2
Euro OTC	Triclosan	1107030-01	4
Caelo	Triclosan	11076715	1
Caelo	Triclosan	11076717	3
Caelo	Triclosan	11076716	1
Caelo	Triclosan	11238002	1
Caelo	Triclosan	11238003	2
Fagron	Triclosan	11238004	1
Caelo	Triclosan	11238004	1
Caelo	Triclosan	11238009	2
Caelo	Triclosan	11238011	3
Caelo	Triclosan	1125204	1
Caelo	Triclosan	11238014	1
Fagron	Triclosan	11A05-N13	1
Caelo	Triclosan	11D20-N10	2
Fagron	Triclosan	11D20-N10	3
Anzag am 24.05.2012	Triclosan	11d20-n10	1
Caelo	Triclosan	11d20-n10	1
Fagron	Triclosan	11H09-N02	9
Anzag	Triclosan	11H09-N02	1
Fagron	Triclosan	11J28-N02	8
Gehe	Triclosan	11J28-N02	1
Noweda	Triclosan	11J28-N02	1
Fagron	Triclosan	11L19-N11	6
Noweda	Triclosan	11L19-N11	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
DAC 2006	Triclosan	12003201	2
Caelo	Triclosan	12003201	3
Caelo	Triclosan	12003202	2
PHOENIX am 12.06.2012	Triclosan	12003202	1
Phoenix	Triclosan	12003202	1
Caelo	Triclosan	12003205	13
Caelo	Triclosan	12003210	6
Phönix	Triclosan	1202018-01	2
EuRho	Triclosan	1202018-01	1
Euro OTC	Triclosan	1202018-01	1
Euro OTC	Triclosan	1202018-02	2
Euro OTC	Triclosan	120203-02	1
Phönix	Triclosan	1206034-01	1
Gehe	Triclosan	1206034-01	1
Euro OTC	Triclosan	1206034-01	1
Gehe	Triclosan	1206034-02	1
Fagron	Triclosan	1209213402	1
Euro OTC	Triclosan	1211025-01	11
Euro OTC	Triclosan	1206034-02	1
Caelo	Triclosan	1214510	1
Caelo	Triclosan	12145901	5
anzag, 26.11.2012	Triclosan	12145902	1
Caelo	Triclosan	12145902	4
Caelo	Triclosan	12145906	6
Mühlen-Apotheke	Triclosan	12145906	1
Caelo	Triclosan	12145907	12
Caelo	Triclosan	12145908	7
Phönix	Triclosan	12145908	1
Caelo	Triclosan	12145909	12
Caelo	Triclosan	12145910	12
Gehe	Triclosan	12145910	1
Caelo	Triclosan	12145917	1
Caelo	Triclosan	12359104	5
Fagron	Triclosan	1214I03402	1
Gehe	Triclosan	12359104	1
Caelo	Triclosan	12359105	7
Sanacorp	Triclosan	12359105	2
Gehe	Triclosan	12359105	1
Caelo	Triclosan	12359106	12
Sanacorp	Triclosan	12359106	1
sana corp	Triclosan	12359106	1
Caelo	Triclosan	12359108	12
Caelo	Triclosan	12359107	1
Noweda	Triclosan	12359107	1
Phönix	Triclosan	12359109	1
Caelo	Triclosan	12359109	6
Caelo	Triclosan	12359110	7
Caelo	Triclosan	12359111	9
Bombastus	Triclosan	12359111	1
Phönix, 02.08.2013	Triclosan	12359111	1
Phönix	Triclosan	12359111	1
Caelo	Triclosan	12359112	5
AHD, 02,12,13	Triclosan	12359112	1
Gehe	Triclosan	12359112	1
anzag 20.11.2013	Triclosan	12359114	1
Gehe	Triclosan	12359114	1
Caelo	Triclosan	12c21-n05	1
Caelo	Triclosan	12359114	1
Gehe	Triclosan	12C21-N05	3
Fagron	Triclosan	12C21-n05	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Triclosan	12C21-N05	29
Fagron	Triclosan	12c21-n05	5
Fiebig ek: 9,54EUR 31.08.12	Triclosan	12C21-N05	1
FARGON	Triclosan	12c21-n05	1
Noweda	Triclosan	12C21-N05	1
Sino Phyto	Triclosan	12C21-N05	1
Caelo	Triclosan	12C21-N05	1
Fagron	Triclosan	12C21-N05	1
Fagron	Triclosan	12C21-N05	1
Fagron	Triclosan	12d02-n02	1
Fagron	Triclosan	12G09-N09	5
Anzag	Triclosan	12G09-N09	2
Alliance Healthcare	Triclosan	12G09-N09	1
Fagron	Triclosan	12G09-no9	1
Fagron	Triclosan	12G17-N04	32
Fagron	Triclosan	12G17-n04	1
Caelo	Triclosan	12G17-N04	2
Anzag 4.12.12 ek:8,89	Triclosan	12G17-N04	1
Fagron	Triclosan	12g17-n04	6
Großhandel	Triclosan	12G17-N04	1
Fargon	Triclosan	12G17-N04	1
Euro OTC	Triclosan	12G17-N04	1
fargon	Triclosan	12G17-N04	1
Fagron	Triclosan	12G17N04	2
Kehr	Triclosan	12G17-N04	2
Anzag	Triclosan	12G17-N04	3
Krieger	Triclosan	12g17-N04	1
Noweda	Triclosan	12G17-N04	3
Gehe	Triclosan	12G17-N04	1
Fagron	Triclosan	12G17-No4	1
Fagron	Triclosan	12L06-0003	1
Bombastus	Triclosan	12L06-N01	2
Anzag 18.04.13 ek: 8.89EUR	Triclosan	12L06N01	1
Alliance Healthcare/Now...	Triclosan	12L06-N01	1
Caelo	Triclosan	12L06-N01	9
Gehe	Triclosan	12l06-n01	1
Alliance Healthcare	Triclosan	12L06-N01	1
GEHE	Triclosan	12L06-N01	1
Phönix	Triclosan	12L06-N01	2
Caelo	Triclosan	12l06-n01	1
Fagron	Triclosan	12l06-n01	1
Caelo	Triclosan	12L06-N01/0005900346	1
Fagron	Triclosan	12L06-N01	1
Fagron	Triclosan	13/10-N02	1
Euro OTC	Triclosan	1303011-01	6
Euro OTC	Triclosan	130301101	1
EuRho/Phönix	Triclosan	1307050-01	2
Caelo	Triclosan	13247805	1
Euro OTC	Triclosan	1307050-01	4
Noweda	Triclosan	13247903	1
Caelo	Triclosan	13247903	1
Gehe	Triclosan	13247903	1
Sanacorp	Triclosan	13247904	2
Caelo	Triclosan	13247904	9
Caesar&Loretz GmbH/Anzag	Triclosan	13247904	2
Caelo	Triclosan	13247905	9
phönix	Triclosan	13247905	1
Caelo	Triclosan	13391801	2
Caeolo/Noweda	Triclosan	13247905	1
Caelo	Triclosan	13391802	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Triclosan	13391804	2
Caelo	Triclosan	13391804	5
GEHE 22.04.2014	Triclosan	13391804	1
Caelo	Triclosan	13391807	6
Sanacorp	Triclosan	13391807	2
Phönix Gotha	Triclosan	13391807	1
Caelo	Triclosan	13391808	8
Fagron	Triclosan	13A11-N03	9
Gehe	Triclosan	13391811	1
Fagron	Triclosan	13a11n03	1
Gehe	Triclosan	13A11-N03	1
Fagron	Triclosan	13A11N03	1
BASF Grenzach GmbH/Phönix	Triclosan	13A11-N03	1
Phönix	Triclosan	13A11-N03	1
Caelo	Triclosan	13A11-N03	2
BASF Grenzach GmbH/Phönix	Triclosan	13A11-No3	1
Fagron	Triclosan	13A11-N03	1
GEHE	Triclosan	13D02-N02	2
Caelo	Triclosan	13D02-N02	7
Fagron	Triclosan	13D02-N02	72
Gehe	Triclosan	13D02-N02	3
Fagron	Triclosan	13D02N02	1
Fargon	Triclosan	13D02-N02	2
AHC 02.09.13 EK9,04	Triclosan	13D02-N02	1
Fischar/Gehe	Triclosan	13D02-N02	2
Alliance Healthcare	Triclosan	13D02-N02	1
BASF Grenzach GmbH/Phönix	Triclosan	13D02-N02	1
Euro OTC	Triclosan	13D02-N02	1
Fagron	Triclosan	13d02-N02	1
Fagron	Triclosan	13D02-N-02	1
Fragron	Triclosan	13D02-N02	1
Caelo	Triclosan	13D02-No2	1
Fagron	Triclosan	13D02-N0Z	1
Fagron	Triclosan	13D02-N02	1
Fagron	Triclosan	13Do2-No2	2
Sanacorp	Triclosan	13D02-No2	1
Fagron	Triclosan	13Do2-N02	1
Fagron	Triclosan	13H08-N10	22
Fagron	Triclosan	13H08N10	2
Caelo	Triclosan	13H08-N10	2
Fagron	Triclosan	13H08-N-10	1
Sanacorp	Triclosan	13H08-N10	1
Fagro/Gehe	Triclosan	13H08-N10	1
Euro OTC	Triclosan	13H08-N10	1
Fagron	Triclosan	13H08-N100450/1231	1
Fagron	Triclosan	13H09-N01	66
Caelo	Triclosan	13H09-N01	4
BASF Grenzach GmbH/Phönix	Triclosan	13H09-N01	1
Alliance Healthcare/Fis...	Triclosan	13H09-N01	1
Phönix	Triclosan	13H09-N01	1
Fagron	Triclosan	13H09N01	2
Fagron	Triclosan	13H09-No1	2
Fagron	Triclosan	13H09-N01	1
Fagron	Triclosan	13J10-N02	1
Fagron	Triclosan	13L18-35-289995	1
Phonix	Triclosan	13L18-B35	1
Alliance Healthcare	Triclosan	13L-18-835	1
Fagron	Triclosan	13L18-B35	10
Fagron	Triclosan	13L18-B35289995	1
Fagron	Triclosan	13L18-B35-289	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Triclosan	13L18-B35-289983	6
Fagron	Triclosan	13L18-B35-289984	3
Raben-Apotheke Mildenau	Triclosan	13L18-B35-289984	2
Fagron	Triclosan	13L18B35289984	1
Fagron	Triclosan	13L18-B35-289985	12
noweda	Triclosan	13L18-B35-289985	1
Fagron	Triclosan	13L-18-B35-289985	1
Phönix	Triclosan	13L18-B35-289985	1
Caelo	Triclosan	13L18-B35-289985	1
Fagron	Triclosan	13L18-B35-289986	6
Caelo	Triclosan	13L18-B35-289986	2
Caelo	Triclosan	13L18B35289986	1
Gehe	Triclosan	13L18-B35-289987	1
Fagron	Triclosan	13L18-B35-289987	7
Fagron	Triclosan	13L18B35289987	1
Caelo	Triclosan	13L18-B35-289987	1
Fagron	Triclosan	13L18-B35-289988	2
Caelo	Triclosan	13L18-B35-289992	1
Fagron	Triclosan	13L18-B35-289993	3
Caelo	Triclosan	13L18B35289993	1
Fagron	Triclosan	13L18B35-289993	1
Euro OTC	Triclosan	13L18-B35-289993	1
Fagron	Triclosan	13L18-B35-289994	5
Fagron	Triclosan	13L18-B35-289995	6
Phönix	Triclosan	13L18-B35-289995	2
Sonnenberg-Apotheke	Triclosan	13L18-B35-289995	1
Alliance Health 26.11.2...	Triclosan	13L18-B35-289995	1
Euro OTC	Triclosan	1401038-01	8
Phönix	Triclosan	13L8-B35	1
EuRho / 30	Triclosan	1401038-01	1
Euro OTC	Triclosan	140103801	1
Caelo	Triclosan	14052101	5
Fagron	Triclosan	1403217068	1
EuRho/Phoenix	Triclosan	1401038-01	1
Caelo	Triclosan	14052102	9
GEHE 17.06.2014	Triclosan	14052102	1
Caelo	Triclosan	14052103	13
Euro OTC	Triclosan	1406032-01	5
Gehe	Triclosan	1406032-01	1
Sanacorp	Triclosan	14052103	1
Gehe	Triclosan	14052105	1
Apomix/Noweda	Triclosan	1406032-01	2
Euro OTC	Triclosan	140603201	1
Euro OTC	Triclosan	1408024-01	4
EuRho	Triclosan	1408024-01	1
Gehe	Triclosan	1408024-01	1
Phönix Gotha	Triclosan	1408024-01	2
Noweda	Triclosan	1408024-01	1
Caelo	Triclosan	14121203	5
Caelo	Triclosan	14121204	5
Caelo	Triclosan	14121207	8
Phoenix 19.11.14	Triclosan	14121207	1
ebe a	Triclosan	14121207	1
Caelo	Triclosan	14121209	4
Nowed 18.12.2014	Triclosan	14121210	1
Caelo	Triclosan	14121210	5
Caelo	Triclosan	14121211	4
Sanacorp	Triclosan	14121211	1
Caelo	Triclosan	14121214	7
Caelo	Triclosan	14121215	10

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar&Loretz GmbH/Anzag	Triclosan	14121215	2
Caelo	Triclosan	14205901	4
Sanacorp	Triclosan	14121215	1
Caelo	Triclosan	14121220	1
Caelo	Triclosan	14205902	5
Caelo	Triclosan	14205903	9
Phoenix	Triclosan	14205903	1
Caelo	Triclosan	14205904	3
Caelo	Triclosan	14205905	4
Caelo	Triclosan	14211211	1
Caelo	Triclosan	1425903	1
Fagron	Triclosan	14F23-B02	4
Caelo	Triclosan	14f23-b02-29385	1
Caelo	Triclosan	14F23B02293859	1
Fagron	Triclosan	14F23-B02-293852	1
Fagron	Triclosan	14F23-B02-295756	1
Fagron	Triclosan	14F23-B02-295757	1
Fagron	Triclosan	14F23-B02-295758	7
Fagron	Triclosan	14F23-B02-295759	6
Fagron	Triclosan	14F23-B02-295760	7
Fagron	Triclosan	14F23-B02-295761	8
Fagron	Triclosan	14F23-B02-295763	1
Fagron	Triclosan	14F23-B02-295762	1
Fagron	Triclosan	14F23B02295763	1
Fagron	Triclosan	14F23-B02-295764	2
Cealo/AHD	Triclosan	14F23-B02-295947	1
Fagron	Triclosan	14F23-B02-295765	6
Fagron	Triclosan	14F23-B02-295948	3
Fagron	Triclosan	14F23-B02-295947	1
Fagron	Triclosan	14F23-B02-2959947	1
Fagron	Triclosan	14F23B02300219	1
Fagron	Triclosan	14F23-B02-300219	6
Phönix	Triclosan	14F23-Bo2-29575	1
Fagron	Triclosan	14F-B02-293859	1
Euro OTC	Triclosan	1501032-01	4
Kremer/Phönix	Triclosan	15/157/T	1
Euro OTC	Triclosan	1501032-02	3
Euro OCT/Noweda	Triclosan	1501032-02	1
Euro OTC	Triclosan	1505009-01	6
Euro OTC	Triclosan	150500901	1
Sanacorp	Triclosan	1505009-01	1
Euro OTC	Triclosan	1507041-01	5
EuRho	Triclosan	151004501	1
Euro OTC	Triclosan	1510045-01	3
Euro UTC	Triclosan	1510045-01	1
Fagron	Triclosan	151010-B06-312984	1
Caelo	Triclosan	15121202	1
Noweda	Triclosan	15203603	2
Caesar&Loretz GmbH/Anzag	Triclosan	15203603	2
Caelo	Triclosan	15203603	9
Fagron	Triclosan	15203604	1
Caelo	Triclosan	15203604	7
Noweda	Triclosan	15203604	1
Caesar&loretz,Phönix	Triclosan	15203606	1
Caelo	Triclosan	15203606	4
Caelo	Triclosan	15203607	8
caesar&loretz,Phönix	Triclosan	15203607	1
Euro OTC	Triclosan	15203607	1
Caesar & Loretz GmbH Hi...	Triclosan	15203607	1
Caelo	Triclosan	15203608	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Triclosan	1520603	1
Caelo	Triclosan	15301501	1
Caelo	Triclosan	15301502	3
Caelo	Triclosan	15301503	4
Caelo	Triclosan	15301504	6
Caesar & Loretz GmbH Hi...	Triclosan	15301504	2
Caelo	Triclosan	15301505	4
Caesar&Loretz GmbH/Sana...	Triclosan	15301505	1
Caelo	Triclosan	15301506	3
Caelo	Triclosan	15301511	2
Caelo	Triclosan	15301510	1
Caelo	Triclosan	15301512	4
Caelo	Triclosan	15301513	1
Caelo	Triclosan	15301514	2
Fagron	Triclosan	15C10-B06	3
Phoenix	Triclosan	15C10-B06	1
Fagron	Triclosan	15C10-B06-310031	1
Fagron	Triclosan	15C10-B06-310032	2
Fagron	Triclosan	15C10-B06-311161	8
Fagron	Triclosan	15C10B06311161	1
Fagron	Triclosan	15c10-B06-311161	1
Caelo	Triclosan	15C10-B06-311161	1
Fagron	Triclosan	15C10-B06-312980	1
Fagron	Triclosan	15C10-B06-312981	5
Fagron	Triclosan	15C10-B06-312982	8
Caelo	Triclosan	15C10-B06-312982	1
Fagron	Triclosan	15C10-B06-312983	2
Fagron	Triclosan	15C10B06312983	1
Fagron	Triclosan	15C-B06-312982	1
Fagron	Triclosan	15C10-Bo6-311161	1
Fagron	Triclosan	15G07-B03-310038	4
Fagron	Triclosan	15G07-B03	3
Caelo	Triclosan	15G07-B03-30039	1
Fagron	Triclosan	15G07-B03-310035	2
Fagron	Triclosan	15G07-B03-310036	1
Caelo	Triclosan	15G07-B03-310037	1
Fagron	Triclosan	15G07B03310037	1
Fagron	Triclosan	15G07-B03-310037	7
Hageda/Fargon	Triclosan	15G07-B03-310038	1
Caelo	Triclosan	15G07-B03-310038	1
Fagron	Triclosan	15G07-B03-310039	1
Fragron	Triclosan	15G07-B03-310040	1
Fagron	Triclosan	15G07-B03-310040	3
Fagron	Triclosan	15G07B03310040	1
Euro OTC	Triclosan	1602003-01	7
Caelo	Triclosan	16021306	1
Caelo	Triclosan	16084601	3
Euro OTC	Triclosan	160702-01	1
Euro OTC	Triclosan	1607002-01	1
Caelo	Triclosan	16084602	2
Caelo	Triclosan	16084603	2
Caesar & Loretz/AHC	Triclosan	16084603	2
Fagron	Triclosan	16084603	1
Caelo	Triclosan	16084608	2
Caelo	Triclosan	16084607	1
Caelo	Triclosan	16084609	1
Caesar&Loretz GmbH	Triclosan	16084609	1
Caelo	Triclosan	16084610	1
Caelo	Triclosan	16084611	3
Phoenix	Triclosan	16084614	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Triclosan	16084614	3
Euro OTC	Triclosan	16084614	1
Caelo	Triclosan	16084618	1
Euro OTC	Triclosan	1609005-01	2
Gehe	Triclosan	16280801	2
Caelo	Triclosan	16280801	2
Caelo	Triclosan	16280805	1
Fagron	Triclosan	17G07-B03-310038	1
Caelo	Triclosan	20021304	1
Caelo	Triclosan	2213M-03402	1
Fagron	Triclosan	2513Q-03402	1
Caelo	Triclosan	23121409	1
Caelo	Triclosan	2613Q-03402	1
Sanacorp	Triclosan	26/AKD1	1
Caelo	Triclosan	4212E-03402	1
Euro OTC	Triclosan	700228	1
Fagron	Triclosan	2901313402	1
Caelo	Triclosan	5012E-03402	1
Sanacorp	Triclosan	28/AKD4	1
Fagron	Triclosan	700228-0005	1
Caelo	Triclosan	AKD12	1
Fagron	Triclosan	C12H7C1302	1
Caelo	Triclosan		4
Sanacorp	Triclosan		1
Euro OTC	Triclosan	CHB1303011-01	1
Fagron	Triclosan	TCS0214037	1
Fagro/Sanacorp	Triclosan	TCS0214037	1
Gutenberg-Apotheke	Triclosan	13H09-N01	2
Gutenberg-Apotheke	Triclosan	13L18-B35	1
Fargon	Triclosan	14F23-B02-295948	1
Beiersdorf	Triclosan	14F23-B02-295764	1
Caelo/Noweda	Triclosan	15301505	1
Fagron	Triclosan	15C10-B06-3161	1
Caelo	Triclosan	16280802	1
Caelo	Triclosan	P144/14	1
Anzag	Triclosan	5846205	1
Gehe	Triclosan	11/28-N02	1
Gehe	Triclosan	11D20-N10	1
Herbasinica	Triclosan	11d20-n10	1
Gehe	Triclosan	11H09-N02	1
Fagron	Triclosan	12G09N09	1
A.H.D.	Triclosan	12L06-N01	1
Eigenproduktion	Triclosan	13A11-N03	1
Sanacorp	Triclosan	13D02-N02	1
Caelo	Triclosan	13H09-No1	1

- 54 689 spectra from 335 *Apo-Ident* customers from a total of 20 325 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Triclosan* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all

relevant spectra of the various substances were compared with *Triclosan* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	300	0	75 578
Type B	0	256	0	81 092
Type C	0	1299	13	54 689

The substance/substance group *Triclosan* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 97.6563 %)
Type C	100.0000 % (> 99.8622 %)	99.0091 % (> 98.7805 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20005	20005	0.00	55.43
21509	22373	2.68	51.76
21591	22373	3.54	54.13
21615	22373	2.44	56.18
21856	21856	0.00	51.50
22227	22227	0.00	48.65
22373	22373	0.00	51.03
22987	22987	0.00	46.55

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Trometamol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20004-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Trometamol; Trometamolum

Special notes

When selecting the *Trometamol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Trometamol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Trometamol	83303189	20004	30	I 2009 000 276
Fagron	Trometamol	13E22-N05	20856	40	20130709
Caelo	Trometamol	14050002	21358	40	20140220

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 110 spectra of 3 reference samples from the substance/substance group *Trometamol*. These samples are listed above in the [calibration samples](#) section.
- 75 768 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 40 spectra of 1 reference samples from the substance/substance group *Trometamol*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Trometamol	161688	22629	40

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 302 spectra from 154 *Apo-Ident* customers from 90 batches from the substance/substance group *Trometamol*.

Supplier	Substance	Batch	Spectra
Caelo	Trometamol	213E-02519	1
Caelo	Trometamol	215I-02519	1
Caelo	Trometamol	313I-02519	1
Caelo	Trometamol	314Q2519	1
Caelo	Trometamol	8031301	1
Caelo	Trometamol	914I-02519	1
Caelo	Trometamol	1001312519	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Trometamol	11025103	1
Caesar & Loretz	Trometamol	11160707	1
Caelo	Trometamol	11160707	2
Gehe	Trometamol	11160708	1
Caelo	Trometamol	11160711	1
Caesar & Loretz GmbH, 4...	Trometamol	11160714	1
Caelo	Trometamol	11160714	4
GEHE	Trometamol	11376005	1
Caelo	Trometamol	11376005	5
Noweda	Trometamol	11376005	1
Caelo	Trometamol	11376006	9
Apotheke in Steinkuhl	Trometamol	120104/11	1
Fagron	Trometamol	11H08-N05	1
Euro OTC	Trometamol	1203005-02	2
Noweda	Trometamol	12113502	1
Caelo	Trometamol	12113502	3
Großhandel	Trometamol	12113506	1
Caelo	Trometamol	12113506	8
Caelo	Trometamol	12113512	10
Anzag	Trometamol	12113512	1
Caelo	Trometamol	12113510	1
Caelo	Trometamol	12113511	1
Caelo	Trometamol	12113508	1
Phönix	Trometamol	12113512	1
ANZAG	Trometamol	12113512	1
Caelo	Trometamol	12113515	5
Fagron	Trometamol	12I27-N03	2
Fagron	Trometamol	12E25-B40	1
Fagron	Trometamol	12I27-N03	1
Fagron	Trometamol	12I27-No3	2
Fagron	Trometamol	12K14-N05	2
Fagron	Trometamol	12k14n05	1
Caelo	Trometamol	12K14-N05	1
Fagron	Trometamol	12k14no5	1
Fagron	Trometamol	13/19-B02-286158	3
Phönix Gotha	Trometamol	13/19-B02-286158	1
Fagron	Trometamol	13/19-B02	1
Caelo	Trometamol	13051401	1
Fagron	Trometamol	13/19-B02-293595	1
Caelo	Trometamol	13095901	9
Gehe	Trometamol	13095901	1
Phönix 1. 07. 2013	Trometamol	13095901	1
Caelo	Trometamol	13095902	11
Phönix, 02.08.2013	Trometamol	13095902	1
Klenk	Trometamol	13095902	2
Caesar & Loretz GmbH, 4...	Trometamol	13095902	1
Caelo	Trometamol	13095905	1
Caelo	Trometamol	13095910	4
Caelo	Trometamol	13095911	15
Caelo	Trometamol	13095912	15
Phönix	Trometamol	13095912	2
Sanacorp	Trometamol	13095912	1
Caelo	Trometamol	13095915	2
Caelo	Trometamol	13095913	3
Phönix Gotha	Trometamol	1319-B02-286158	1
Caelo	Trometamol	13339103	7
Fagron	Trometamol	13339103	1
Caelo	Trometamol	13339107	5
Caelo	Trometamol	13339108	10
Caelo	Trometamol	1339103	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Trometamol	13C08-N07	3
Caelo	Trometamol	13C-08-N07	1
Fagron	Trometamol	13E22-N05	6
Fagron	Trometamol	13I19-B02	1
Fagron	Trometamol	13I19-B02-286158	1
Gehe	Trometamol	13E22-N05	1
Fagron	Trometamol	13I19-B02-286158	1
Caelo	Trometamol	14050002	6
Caelo	Trometamol	14050003	3
Caesar & Loretz GmbH	Trometamol	14050003	1
Caelo	Trometamol	14050004	3
Caelo	Trometamol	14050006	1
Caelo	Trometamol	14332402	13
Phönix	Trometamol	14332402	1
Caelo	Trometamol	14332403	1
Caelo	Trometamol	14332404	1
Caelo	Trometamol	15070304	9
Caelo	Trometamol	15070307	2
Caelo	Trometamol	15070308	9
Caelo	Trometamol	15070309	1
Caelo	Trometamol	15070311	8
Caelo	Trometamol	15094401	9
Caelo	Trometamol	15094404	1
Caelo	Trometamol	15277602	1
Caelo	Trometamol	15377602	8
Sanacorp	Trometamol	15377602	1
Caelo	Trometamol	15377604	1
Caelo	Trometamol	15377607	2
Caelo	Trometamol	15377605	1
Caelo	Trometamol	18081503	1
Caelo	Trometamol	26111201	1
Caelo	Trometamol	27111304	1
Fagron	Trometamol	286158	1
Fagron	Trometamol	294101	1
Sanacorp	Trometamol	3686G018	1
Caelo	Trometamol	3713E-02519	1
Caelo	Trometamol	5012M-02519	1
Caelo	Trometamol	5315I-02519	1
Caelo	Trometamol		4
Merck	Trometamol	8386F017	1
Fagron	Trometamol	8386E050	1
Sanacorp	Trometamol	8386F030	1
Fagron	Trometamol	C4H11N03	1
Caelo	Trometamol	12113507	3
AHD	Trometamol	13095910	1

- 55 699 spectra from 335 *Apo-Ident* customers from a total of 20 523 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Trometamol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose,

all relevant spectra of the various substances were compared with *Trometamol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	110	0	75 768
Type B	0	40	0	81 308
Type C	0	294	8	55 699

The substance/substance group *Trometamol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 94.5455 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.3510 % (> 96.3576 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20004	20004	0.00	38.42
20856	20004	12.42	34.44
21358	20004	6.98	38.50

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tropicamide**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20598-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tropicamide; Tropicamidum

Special notes

When selecting the *Tropicamide* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tropicamide*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tropicamide	12C26-N02	20598	40	20120413
Fagron	Tropicamide	12C26-N02	20626	40	20120413
Fagron	Tropicamide	14D23-B04-293294	21685	40	AR-15-FG-001641-01
Fagron	Tropicamide	16G19-B05-324829	22885	40	20160905

Validation samples

A total of 213 227 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 *Tropicamide*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *Tropicamide*.

Supplier	Substance	Batch	Sample ID	Spectra
zu erfassen	Tropicamide	pending	20514	40
Fagron	Tropicamide	14D23-B04-293294	21685 [†]	20

- 81 288 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 7 *Apo-Ident* customers from 16 batches from the substance/substance group *Tropicamide*.

Supplier	Substance	Batch	Spectra
Fagron	Tropicamide	12B01-N02	1
Fagron	Tropicamide	12C26-N02	1
Fagron	Tropicamide	12F18-N06	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
Fagron	Tropicamide	13A30-N06	1
Fagron	Tropicamide	12104-n03	1
Fagron	Tropicamide	13L31-B08-289830	1
Fagron	Tropicamide	13L-31-B08-292075	1
Fagron	Tropicamide	14D23-B04	1
Phoenix	Tropicamide	14L04-B02	2
Fagron	Tropicamide	14D23B04293294	1
Gehe	Tropicamide	15F-18B-04	1
Fagron	Tropicamide	Ch12L04-N03	2
Gehe	Tropicamide	15F18-B04	1
Fagron	Tropicamide	23071508	1
Fagron	Tropicamide	20021302	1
Fagron	Tropicamide	Ch13L31-B08-289830	1

- 55 980 spectra from 335 *Apo-Ident* customers from a total of 20 595 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tropicamide* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tropicamide* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	60	0	81 288
Type C	0	21	0	55 980

The substance/substance group *Tropicamide* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 71.4286 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20598	21685	7.47	41.51
20626	21685	8.53	38.89
21685	21685	0.00	44.70
22885	21685	17.67	42.17

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tyrosine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21574-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tyrosine; Tyrosinum

Special notes

When selecting the *Tyrosine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tyrosine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tyrosine	13G24-N22	21574	40	1411030
Euro OTC	Tyrosine	L1401037-01	21586	40	20140217

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group *Tyrosine*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Tyrosine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tyrosine	13G24-N22	21574 [†]	20
Euro OTC	Tyrosine	L1401037-01	21586 [†]	20

- 81 308 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Tyrosine*.

Supplier	Substance	Batch	Spectra
Fagron	Tyrosine	12H09-N09	1
Euro OTC	Tyrosine	L1210050-01	1
Dr. Behr	Tyrosine	WE14080018	1
Euro OTC	Tyrosine	L1401037	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*.

- 55 997 spectra from 335 *Apo-Ident* customers from a total of 20 607 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tyrosine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tyrosine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	40	0	81 308
Type C	0	4	0	55 997

The substance/substance group *Tyrosine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21574	21574	0.00	62.31
21586	21574	8.91	60.75

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Tyrothricin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20732-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Tyrothricin; Tyrothricinum

Special notes

When selecting the *Tyrothricin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Tyrothricin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Tyrothricin	12K14-N01	20732	40	1509178
Fagron	Tyrothricin	12K14-N01	21683	40	AR-15-FG-001172-01
Fagron	Tyrothricin	14A23-B05-294146	21876	40	AR-15-FG-015005-01

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Tyrothricin*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 146 spectra of 4 reference samples from the substance/substance group *Tyrothricin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Tyrothricin	12K14-N01	21683 [†]	20
Fagron	Tyrothricin	14A23-B05-294146	21876 [†]	20
Fagron	Tyrothricin	12K14-N01	21683SI	60
Fagron	Tyrothricin	14A23-B05-294146	21876SI	46

- 81 202 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Tyrothricin*.

Supplier	Substance	Batch	Spectra
Fagron	Tyrothricin	13A14-N04	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Tyrothricin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Tyrothricin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	76	70	81 202
Type C	0	1	0	56 000

The substance/substance group *Tyrothricin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	52.0548 % (> 50.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20732	20732	0.00	35.91
21683	21683	0.00	36.45
21876	21876	0.00	39.76

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Ubidecarenone**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20392-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Ubidecarenone; Ubidecarenonum

Special notes

When selecting the *Ubidecarenone* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Ubidecarenone*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Dr. Behr	Ubidecarenone	WE-11100005	20392	40	AR-12-FG-008250-01
Euro OTC	Ubidecarenone	1205029-01	21247	40	20121009
Caelo	Ubidecarenone	14004504	21388	40	AR-15-FG-009220-01

Validation samples

A total of 213 227 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 *Ubidecarenone*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Ubidecarenone*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Ubidecarenone	10H19-N10	20360	40
Caelo	Ubidecarenone	14004504	21388 [†]	20
Euro OTC	Ubidecarenone	1605030	22696	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 6 *Apo-Ident* customers from 13 batches from the substance/substance group *Ubidecarenone*.

Supplier	Substance	Batch	Spectra
Fagron	Ubidecarenone	14H26-B04-298244	1
Euro OTC	Ubidecarenone	1515M-07029	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
Fagron	Ubidecarenone	10H19-N-10	1
Audor Pharma	Ubidecarenone	APSZFQ150614C	1
Audor Pharma	Ubidecarenone	APSCFQ150614C	1
Cfm Oskar Tropitzsch	Ubidecarenone	5300001	1
Fagron	Ubidecarenone	14E12-B06-293861	1
Euro OTC	Ubidecarenone	L1403020-01	1
Euro OTC	Ubidecarenone	1014E-07029	1
Euro OTC	Ubidecarenone	1403020-02	1
Euro OTC	Ubidecarenone	1205029-01	1
Euro OTC	Ubidecarenone	1104003-01	1
Euro OTC	Ubidecarenone	L1412004-01	1

- 55 988 spectra from 335 *Apo-Ident* customers from a total of 20 598 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Ubidecarenone* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Ubidecarenone* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	100	0	81 248
Type C	0	13	0	55 988

The substance/substance group *Ubidecarenone* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 94.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested

reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20392	20392	0.00	43.92
21247	21388	9.50	47.01
21388	21388	0.00	46.53

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Urea**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20017-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Urea; Carbamidum; Urea pura; Ureum

Special notes

When selecting the *Urea* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Urea*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Urea	82374239	20017	30	I 2009 000 301
Fagron	Urea	12F25-N05	20712	40	20120724
Euro OTC	Urea	1404024-01	21537	40	20140519
Caelo	Urea	15154103	22315	40	20150722
Fagron	Urea	14I18-B03-303581	22317	40	20141003
Caelo	Urea	170216	23033	40	20170202*
Caelo	Urea	15154103	22315SI	40	20150722
Fagron	Urea	14I18-B03-303581	22317SI	40	20141003

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 310 spectra of 8 reference samples from the substance/substance group *Urea*. These samples are listed above in the [calibration samples](#) section.
- 75 568 spectra from a total of 1570 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 320 spectra of 10 reference samples from the substance/substance group *Urea*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Urea	1404024-01	21537 [†]	20
Caelo	Urea	15154103	22315 [†]	20
Fagron	Urea	14I18-B03-303581	22317 [†]	20
Euro OTC	Urea	1601044	22376	40
Caelo	Urea	161074	22466	60
Euro OTC	Urea	1604044	22552	40
Caelo	Urea	15154103	22315SI [†]	20
Fagron	Urea	14I18-B03-303581	22317SI [†]	20
Euro OTC	Urea	1604044	22552SI	40
Caelo	Urea	170216	23033SI	40

- 81 028 spectra from a total of 1940 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1068 spectra from 260 *Apo-Ident* customers from 207 batches from the substance/substance group *Urea*.

Supplier	Substance	Batch	Spectra
Caelo	Urea	15154110	13
Caelo	Urea	15154112	6
PHOENIX 29.08.2014	Urea		1
Hirsch	Urea	810811	1
Anzag, 12.12.2012	Urea		1
Caelo	Urea	2324534	1
Caelo	Urea	14107113	14
Fagron	Urea	235/12I04-N06	1
Caelo	Urea	5061410	1
Caelo	Urea		7
Euro OTC	Urea	72/14	1
Caelo	Urea	314Q2544	1
Euro OTC	Urea	1003024-02	2
Caelo	Urea	10116	1
Caelo	Urea	10081208	1
Caelo	Urea	10169722	1
Caelo	Urea	10169726	2
Caelo	Urea	10169731	2
Caelo	Urea	107063	1
Euro OTC	Urea	1110023-01	1
Fagron	Urea	10E31-N06	1
Sanacorp	Urea	1110023-01	1
Caelo	Urea	11120725	1
Caelo	Urea	11150701	2
Caelo	Urea	1113A-025	1
Caelo	Urea	11150702	3
Caelo	Urea	11150703	1
Caesar&loretz,Phoenix	Urea	11150713	1
Caelo	Urea	11150713	1
Caelo	Urea	11150714	2
Bombastus	Urea	11150721	1
Noweda	Urea	11150714	1
Caelo	Urea	11150721	4
Phönix Gotha	Urea	11150721	1
Caelo	Urea	11150722	4
Caesar & Loretz GmbH 40...	Urea	11150722	1
Caelo	Urea	11150725	4
Noweda	Urea	11150725	1
Caelo	Urea	11150736	7
Caelo	Urea	11150731	2
Caesar&loretz,Anzag	Urea	11150738	1
Caesar & Loretz GmbH, 4...	Urea	11150736	1
Caelo	Urea	11150738	2
Fagron	Urea	11H01-N08	2
Fagron	Urea	11D-13-M04	1
Sino Phyto	Urea	118900-0003	1
Fagron	Urea	11C25-N01	1
Fagron	Urea	11F24-N16	1
Anzag am 07.05.2012	Urea	11H01-N08	1
Caelo	Urea	12111801	7
Caelo	Urea	12101301	1
phönix,19.12.2012	Urea	12111801	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Urea	12111802	9
Caelo	Urea	12111803	1
Caesar & Loretz GmbH, 4...	Urea	12111804	1
Beiersdorf	Urea	12111804	2
Caelo	Urea	12111804	8
Gehe	Urea	12111804	1
Phönix Gotha	Urea	12111806	2
Caelo	Urea	12111806	8
Caesar&Loretz,Phoenix	Urea	12111806	3
Caelo	Urea	12111807	9
Klenk	Urea	12111807	1
Noweda	Urea	12111807	1
Caesar&Loretz GmbH D-40...	Urea	12111808	2
Caelo	Urea	12111808	12
Caelo	Urea	12111809	14
Sanacorp	Urea	12111808	1
Phönix	Urea	12111809	1
Phönix 22.04.2013	Urea	12111809	1
Caelo	Urea	12111810	12
Caelo	Urea	1211181	1
Caesar & Loretz GmbH, 4...	Urea	12111810	2
Gehe	Urea	12111810	1
Sanacorp	Urea	12111810	1
Caelo	Urea	12111820	14
Gehe	Urea	12111820	1
Caelo	Urea	12111822	17
Caesar & Loretz GmbH	Urea	12111822	1
Gehe	Urea	12111822	1
GEHE	Urea	12111822	2
Phönix	Urea	12111822	1
Caelo	Urea	12111823	11
Anzag 17.04.13 ek:6,84EUR	Urea	12111823	1
Caesar & Loretz GmbH, 4...	Urea	12111822	1
Caesar/Noweda	Urea	12111823	1
Alliance Healthcare	Urea	12111823	1
Caelo	Urea	12111826	8
Caelo	Urea	12111828	18
Caesar & Loretz GmbH, 4...	Urea	12111828	2
Caelo	Urea	12111834	2
Caelo	Urea	1211804	1
Caelo	Urea	1211802	1
Caelo	Urea	1211806	1
Caelo	Urea	1211809	1
Caelo	Urea	1211820	1
Fagron	Urea	1211822	2
Caelo	Urea	1211808	1
Caelo	Urea	1211823	1
Sanacorp	Urea	1212007	1
Phönix Gotha	Urea	1211806	1
Euro OTC	Urea	1212007-01	10
Euro OTC	Urea	121200701	1
EuRho	Urea	1212007-01	1
Phönix Gotha	Urea	1212007-01	1
Phönix	Urea	1212007-01	1
Caelo	Urea	123456	1
Euro OTC	Urea	1212007-02	1
Laborchemie Apolda/Jenn...	Urea	12345	1
Finze	Urea	1264	1
Anzag, 10.12.2012	Urea	12F25-N05	1
Fagron	Urea	12C20-N05	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Urea	12C20-N05	1
Caelo	Urea	12104-N06	1
Fagron	Urea	12I04-N06	1
Fagron	Urea	12F25-N05	4
Fagron	Urea	12104-N06	1
Caelo	Urea	12L10-N08	1
Fagron	Urea	12L10-N08	5
Fagron	Urea	12110-n08	1
Fagron	Urea	13/17-B02-287602	2
Caelo	Urea	1306412	1
Caelo	Urea	13064201	6
Noweda/KremerGmbH	Urea	13064201	1
Phönix Gotha	Urea	13064202	1
Caelo	Urea	13064202	16
Caesar & Loretz GmbH	Urea	13064203	1
Caelo	Urea	13064203	11
Sanacorp	Urea	13064203	1
Caelo	Urea	13064206	21
Großhandel	Urea	13064203	1
Anzag / Noweda	Urea	13064206	1
Caesar & Loretz GmbH, 4...	Urea	13064206	2
Caesar & Loretz GmbH	Urea	13064206	1
Caelo	Urea	13064207	18
Phönix	Urea	13064207	1
Gehe	Urea	13064207	1
Caesar/Noweda	Urea	13064208	1
Caesar & Loretz GmbH	Urea	1306421	1
Caelo	Urea	13064212	24
Caesar & Loretz GmbH, 4...	Urea	13064212	3
ADH, 04.11.2013	Urea	13064212	1
Caelo	Urea	13064213	7
Caelo	Urea	13064214	14
Caelo	Urea	13064215	15
Sanacorp	Urea	13064215	1
Phönix	Urea	13064215	1
Caesar & Loretz GmbH Hi...	Urea	13064215	1
Gehe	Urea	13064215	1
Caelo	Urea	13064217	2
Caesar&Loretz GmbH/Anzag	Urea	13064217	1
Caelo	Urea	13064221	9
Caelo	Urea	13064223	21
Sanacorp	Urea	13064223	1
Phönix	Urea	13064223	1
Caesar & Loretz GmbH	Urea	13064223	1
Caelo	Urea	13064224	2
Caelo	Urea	13064226	12
Caelo	Urea	13064227	5
Caelo	Urea	13064228	16
Caelo	Urea	13064230	12
Caelo	Urea	13064231	11
Caelo/Phönix	Urea	13064231	1
Phoenix	Urea	13064231	1
Caelo	Urea	13064232	15
Caesar&Loretz GmbH/Anzag	Urea	13064231	1
Gehe	Urea	13064232	1
Caelo	Urea	13064233	15
Caelo	Urea	13064236	8
Phönix	Urea	13064236	1
Caelo	Urea	13064239	2
Caelo	Urea	1317B02-287602	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Anzag/Henry Lamotte	Urea	13-18-B03-303581	1
Euro OTC	Urea	13064239	1
Fagron	Urea	13D03-N01	9
Phönix 19.06.2013	Urea	13D03-N01	1
Fagron	Urea	13D03-N001	1
Dr. August Wolff	Urea	13E17N02	1
Fagron	Urea	13E21-N05	4
Caelo	Urea	13E21-N05	1
Fagron	Urea	13J17-B02	2
PHOENIX 02.05.2014	Urea	13J17-B02-287602	2
Fagron	Urea	13J17-B02-287604	6
Fagron	Urea	13J17-B02-287602	2
Fagron	Urea	13j17-B02-287604	1
Fagron	Urea	13J17B02-287604	1
Raben-Apotheke Mildenau	Urea	13J17-B02-287604	2
Raben-Apotheke Mildenau	Urea	13J17-Bo2-287604	1
Fagron	Urea	13L20-B03-289708	5
Fagron	Urea	13L20B03	1
Fagron	Urea	13L20B03289708	1
Caelo	Urea	14/18-B03-303581	2
Fagron	Urea	14/18-B03-303581	1
Caelo	Urea	14011513	1
Euro OTC	Urea	1404024-01	14
Eurho	Urea	1404024-01	1
Phönix Gotha	Urea	1404024-01	1
Caelo	Urea	14107101	5
Euro OTC	Urea	14107101	2
Sanacorp	Urea	1405028-01	1
Caesar&Loretz GmbH	Urea	14107101	1
Caelo	Urea	14107102	22
Gehe	Urea	14107102	1
Sanacorp	Urea	14107102	1
Phönix	Urea	14107102	1
Caelo	Urea	14107103	10
Caelo	Urea	14107108	6
Bombastus	Urea	14107108	1
Caelo	Urea	14107109	13
Phönix	Urea	14107109	1
Caelo	Urea	14107112	11
Ph.Eur.7.0	Urea	14107109	1
Sanacorp	Urea	14107112	1
Caesar&Loretz GmbH /Anzag	Urea	14107113	1
Caelo	Urea	14107117	5
Caelo	Urea	14107118	4
Caelo	Urea	14107119	14
Caelo	Urea	14107120	6
Caelo	Urea	14107122	12
Fagron	Urea	1418-B03-303581	1
Fagron	Urea	14E07-B05	7
Fagron	Urea	1418b03303581	1
Fagron	Urea	1418B03303581	1
Fagron	Urea	14E07B05	3
Fagron	Urea	14E07-B05-293469	5
Caelo	Urea	14E07-B05-293469	1
Fagron	Urea	14E07-B05-289706	1
Fagron	Urea	14E-07-B05-293469	1
Fagron	Urea	14E07B05293469	1
Fagron	Urea	14E07-B05-297165	1
Fagron	Urea	14E07-B05-297167	4
Alliance health	Urea	14E07-B05-297167	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Urea	14E07-B07-293469	1
Fagron	Urea	14E8900-0001	1
Caelo	Urea	14I18-B03	1
Fagron	Urea	14I18-B03-303576	4
Fagron	Urea	14I18-B03-303581	2
Euro OTC	Urea	1503042-01	11
Fagron	Urea	14118-B03	1
Fagron	Urea	14118-B03-0303581	1
Caelo	Urea	1508/104	1
Caelo	Urea	15087102	3
Caesar & Loretz GmbH	Urea	15087103	1
Caelo	Urea	15087103	10
Phönix	Urea	15087103	1
Caelo	Urea	15087104	9
Caelo	Urea	15087105	9
Caelo	Urea	15087107	9
Caelo	Urea	15087110	12
Phönix	Urea	15087110	1
Caesar&Loretz GmbH /Anzag	Urea	15087110	1
Euro OTC	Urea	1515404	1
Caelo	Urea	15154103	18
Euro OTC	Urea	15154103	1
Caesar & Loretz GmbH Hi...	Urea	15154103	1
Caesar & Loretz GmbH	Urea	15154104	1
Caesar&Loretz/Caesar&Lo...	Urea	15154104	1
Caelo	Urea	15154104	25
Calo/AHD	Urea	15154104	1
Fagron	Urea	15154104	2
Caelo	Urea	15154107	7
Caelo	Urea	15154109	5
Noweda	Urea	15154110	1
Caelo	Urea	15154111	17
Caesar&Loretz GmbH	Urea	15154111	1
Phönix	Urea	15154113	1
Phoenix	Urea	15154113	1
Caelo	Urea	15154113	5
Euro OTC	Urea	1601044-01	2
Caelo	Urea	15154116	1
Bombastus	Urea	1601044-01	1
Caelo	Urea	16107406	2
Fagron	Urea	16D22-B02-322532	1
Caelo	Urea	18071301	1
Caelo	Urea	17011405	1
Fagron	Urea	16D22-B02-326481	1
Fagron	Urea	18-B03-303581	1
Caelo	Urea	20031514	1
Caelo	Urea	17101310	1
Caelo	Urea	20130912-4	1
Fagron	Urea	2014162937	1
Löns Apotheke	Urea	20349	1
Fagron	Urea	2014376618	1
Caelo	Urea	21051304	1
Caelo	Urea	2109212544	1
Caelo	Urea	21111806	1
Caelo	Urea	22111305	1
Caelo	Urea	30031304	1
Caelo	Urea	3012A-02544	1
Caelo	Urea	25082015A	1
Caelo	Urea	26071304	1
Caelo	Urea	3413Q-02544	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Urea	3613M-02544	1
Löns Apotheke	Urea	40003	1
Caelo	Urea	4013Q2544	1
Caelo	Urea	4111M-02544	1
Caelo	Urea	4914I-02544	1
Caelo	Urea	568900	1
Caelo	Urea	62/AKD49	1
Sanacorp	Urea	62/AKD50s	1
Caelo	Urea	63/AKD4	1
Caelo	Urea	82374179	1
Kehr	Urea	CH4N2O	1
Caelo	Urea	AKD6	1
Gutenberg-Apotheke	Urea		1
Phönix Gotha	Urea	V096/2012	1
Sanacorp	Urea	63/AKD1	1
Noweda	Urea	13064223	1
Noweda	Urea	4109M-02544	1
Gehe	Urea	12111808	1
Sanacorp	Urea	12111820	1
Sanacorp	Urea	13064212	1
Caelo	Urea	1306422	1
Gutenberg-Apotheke	Urea	13064227	1
Anzag	Urea	12111801	1
GEHE	Urea	12111802	1
Beiersdorf AG	Urea	14/18-B03-303576	1
Fargon	Urea	14e07-b05-297165	1

- 54 933 spectra from 335 *Apo-Ident* customers from a total of 20 413 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Urea* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Urea* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	310	0	75 568
Type B	0	318	2	81 028
Type C	0	1049	19	54 933

The substance/substance group *Urea* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 98.0645 %)
Type B	100.0000 % (> 99.9853 %)	99.3750 % (> 98.4375 %)
Type C	100.0000 % (> 99.8622 %)	98.2210 % (> 97.9401 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20017	20017	0.00	51.83
20712	23033	6.63	53.24
21537	23033	10.18	55.68
22315	20017	4.04	52.09
22317	20017	3.96	52.69
23033	23033	0.00	53.71

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Uridine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20744-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Uridine; Uridinum

Special notes

When selecting the *Uridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Uridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Uridine	11G07-N04	20744	55	1402481
Fagron	Uridine	13K18-B31-288497	21895	40	20131129

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 95 spectra of 2 reference samples from the substance/substance group *Uridine*. These samples are listed above in the [calibration samples](#) section.
- 75 783 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 25 spectra of 2 reference samples from the substance/substance group *Uridine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Uridine	11G07-N04	20744 [†]	5
Fagron	Uridine	13K18-B31-288497	21895 [†]	20

- 81 323 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 35 spectra from 16 *Apo-Ident* customers from 17 batches from the substance/substance group *Uridine*.

Supplier	Substance	Batch	Spectra
Fagron	Uridine	11G07-N04	1
Fagron	Uridine	12091402	1
Fagron	Uridine	13D08-N26	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
Fagron	Uridine	13D29-N06	4
Fagron	Uridine	13D29-N06	1
Fagron	Uridine	13K18-B31	4
Fagron	Uridine	14051405	1
Fagron	Uridine	14F02-B09-305467	2
Fagron	Uridine	14F02-B09	1
Fagron	Uridine	16101301	1
Fagron	Uridine	22041301	1
siehe WE-Prüfprotokoll	Uridine	54/11	1
Fagron	Uridine	721010040	1
Phönix	Uridine	721010040	1
Caelo	Uridine	721110090	4
Audor Pharma	Uridine	AP721060040/5U	2
Sanacorp	Uridine	AP721060040/5U	1
Audor Pharma	Uridine	AP30514IB1500001AXU	3
Audor Pharma	Uridine	AP30514U	4

- 55 966 spectra from 335 *Apo-Ident* customers from a total of 20 594 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Uridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Uridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	95	0	75 783
Type B	0	25	0	81 323
Type C	0	34	1	55 966

The substance/substance group *Uridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 93.6842 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 76.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.1429 % (> 88.5714 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20744	20744	0.00	47.75
21895	20744	3.35	45.59

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Valine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20405-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Valine; Valinum

Special notes

When selecting the *Valine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Valine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Valine	15A14-B07-307756	21953	40	9198
Euro OTC	Valine	1604055	22571	40	20160601*

Validation samples

A total of 213 227 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 *Valine*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 100 spectra of 3 reference samples from the substance/substance group *Valine*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Valine	L1006023-01	20405	40
Fagron	Valine	15A14-B07-307756	21953 [†]	20
Euro OTC	Valine	1609009	22799	40

- 81 248 spectra from a total of 1944 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Valine*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Valine	L1309029-01	1
Fagron	Valine	121259	1
Euro OTC	Valine	L1106045-01	1
Fagron	Valine	13B13-N05	1
Euro OTC	Valine	L1309029-02	1

- 55 996 spectra from 335 *Apo-Ident* customers from a total of 20 606 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Valine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Valine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	80	20	81 248
Type C	0	4	1	55 996

The substance/substance group *Valine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	80.0000 % (> 77.0000 %)
Type C	100.0000 % (> 99.8625 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21953	21953	0.00	11.60
22571	22571	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 1.3-2017-02

Validated substance/substance group **Vancomycin hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 21748-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Vancomycin hydrochloride; Vancomycini hydrochloridum

Special notes

When selecting the *Vancomycin hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Vancomycin hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Vancomycin hydro...	1407047-01	21748	40	AR-15-FG-008950-01
Euro OTC	Vancomycin hydro...	1506029	21826	40	AR-15-FG-009077-01
Euro OTC	Vancomycin hydro...	1610038	22878	40	20161208*
Euro OTC	Vancomycin hydro...	1604037	22891	40	20160520*

Validation samples

A total of 213 227 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 *Vancomycin hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 240 spectra of 6 reference samples from the substance/substance group *Vancomycin hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Vancomycin hydrochloride	1407047-01	21748 [†]	20
Euro OTC	Vancomycin hydrochloride	1506029	21826 [†]	20
Euro OTC	Vancomycin hydrochloride	1407047-01	21748SI	60
Euro OTC	Vancomycin hydrochloride	1506029	21826SI	60
Euro OTC	Vancomycin hydrochloride	1610038	22878SI	40
Euro OTC	Vancomycin hydrochloride	1604037	22891SI	40

- 81 108 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *Vancomycin hydrochloride*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Vancomycin hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Vancomycin hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	73	167	81 108
Type C	0	0	0	56 001

The substance/substance group *Vancomycin hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	30.4167 % (> 29.1667 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21748	21748	0.00	28.38
21826	21826	0.00	34.17
22878	22878	0.00	31.02
22891	22891	0.00	32.17

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Vanillin**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20204-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Vanillin; Vanillinum

Special notes

When selecting the *Vanillin* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Vanillin*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Vanillin	10L22-N17	20204	40	AR-12-FG-002700-01
Caelo	Vanillin	14044413	21737	40	20140227
Fagron	Vanillin	13J01-N07	21738	40	20130926
Caelo	Vanillin	15135302	21924	40	20150417
Caelo	Vanillin	160895	22484	40	20160421*

Validation samples

A total of 213 227 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 *Vanillin*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 5 reference samples from the substance/substance group *Vanillin*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	Vanillin	7F29-N07	20217	40
Caelo	Vanillin	14044413	21737 [†]	20
Fagron	Vanillin	13J01-N07	21738 [†]	20
Caelo	Vanillin	15135302	21924 [†]	20
Caelo	Vanillin	160895	22484 [†]	20

- 81 228 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 44 spectra from 34 *Apo-Ident* customers from 30 batches from the substance/substance group *Vanillin*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Fagron	Vanillin	314Q2548	1
Dr.Hollborn	Vanillin	6082015	1
Fagron	Vanillin	8L05-N07	1
Caelo	Vanillin	10066811	1
Caesar & Loretz GmbH D-...	Vanillin	10066830	1
Caelo	Vanillin	10066830	2
Fagron	Vanillin	10L22-N17	1
Caelo	Vanillin	112901	1
Caesar & Loretz GmbH, 4...	Vanillin	12079412	1
Caesar & Loretz GmbH, 4...	Vanillin	12079401	1
Fagron	Vanillin	11G28-N09	1
Caelo	Vanillin	12079412	3
Caelo	Vanillin	12071401	1
Gehe	Vanillin	12079412	1
Caelo	Vanillin	12079417	1
Caelo	Vanillin	12079424	1
Rhodia GmbH/Noweda	Vanillin	12D02-N03	1
Caelo	Vanillin	12079428	1
Caelo	Vanillin	12h09-n06	1
Sanacorp	Vanillin	12H09-N06	1
Fagron	Vanillin	12H09-N06	3
Fagron	Vanillin	12Ko7-N19	1
fargron	Vanillin	13/01-N07	1
Hedinger/Ebert	Vanillin	13A30-N10	1
Fagron	Vanillin	13I01-N07	1
Fagron	Vanillin	13J01-N07	4
Fagron	Vanillin	14G02-B99-296988	1
Caelo	Vanillin	15135302	1
Caelo	Vanillin	15154006	1
Fagron	Vanillin	232050-0004	1
Caelo	Vanillin	90961269	1
Caelo	Vanillin	15154020	3
Caelo	Vanillin	14044404	1
Caelo	Vanillin	15154017	1

- 55 957 spectra from 335 *Apo-Ident* customers from a total of 20 582 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Vanillin* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Vanillin* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	120	0	81 228
Type C	0	43	1	55 957

The substance/substance group *Vanillin* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	97.7273 % (> 90.9091 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20204	20204	0.00	28.40
21737	22484	5.14	26.97
21738	22484	5.56	26.95
21924	22484	7.23	26.44
22484	22484	0.00	26.88

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Waxes / Fats**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20035-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Waxes / Fats; Adeps solidus; Adeps solidus W35; Cacao oleum; Cera alba; Cera flava; Cetyl palmitate 15; Cetyl palmitas 15; Cetylum palminicum 15; Cocoa butter; Hard fat in pastilles; Hard fat W35; Natrii laurylsulfuricum; Oleum cacao; Paraffin, hard; Paraffin, microcrystalline; Paraffinum durum in rotulis; Paraffinum microcristallinum; Paraffinum solidum in rotulis; Sodium dodecyl sulfate; Sodium dodecyl sulphate; Wax, bleached; Wax, yellow

Special notes

When selecting the *Waxes / Fats* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Waxes / Fats*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Cocoa butter	81070139	20035	65	I 2009 000 296
Caelo	Hard fat in past...	10158804	20174	40	20100709

continued on the next page

continued from previous page

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Sodium dodecyl s...	10229510	20237	40	20100819
Caelo	Hard fat in past...	09318225	20339	40	AR-12-FG-008588-01
Caelo	Paraffin, microc...	11100708	20400	40	20110407
Caelo	Paraffin, hard	11166916	20461	40	AR-13-FG-001125-01
Spinnrad	Wax, bleached	1012402004	20747	40	20121101
Caelo	Cetyl palmitate 15	12331916	20865	40	1402429
Caelo	Sodium dodecyl s...	13099011	20986	40	1403108
Caelo	Hard fat in past...	12158122	21067	40	20120627
Caelo	Wax, yellow	13335507	21433	40	20131011
Caelo	Cocoa butter	13292013	21482	40	20130924
Caelo	Wax, bleached	13378619	21483	20	1509364
Caelo	Hard fat in past...	14126203	21521	40	20140425
Caelo	Paraffin, microc...	14307104	21682	40	AR-15-FG-005277-01
Caelo	Paraffin, hard	13390413	21731	40	20131213
Caelo	Paraffin, microc...	14307106	21766	40	20141014
Caelo	Cetyl palmitate 15	14351606	21875	40	20141219
Fagron	Hard fat W35	15A07-B12-302751	21880	40	1604639
Caelo	Cetyl palmitate 15	15301703	21984	40	AR-16-FG-007435-01
Caelo	Wax, bleached	14336620	22244	40	20141125
Caelo	Wax, yellow	15317602	22245	40	20151007
Caelo	Cetyl palmitate 15	15301703	22325	40	20151013
Caelo	Paraffin, microc...	154128	22330	40	20160112*
Fagron	Hard fat W35	15A07-B12-309245	22338	40	20150115
Caelo	Cocoa butter	14348906	22348	40	20150122
Caelo	Paraffin, hard	15232004	22349	40	1702507
Caelo	Sodium dodecyl s...	15344503	22352	40	20151022
Caelo	Hard fat in past...	160278	22479	40	20160407*
Caelo	Cetyl palmitate 15	160538	22486	40	20160323*
Caelo	Wax, yellow	162750	22767	40	2061007*
Caelo	Wax, bleached	15292022	22956	30	20150827

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 1275 spectra of 32 reference samples from the substance/substance group *Waxes / Fats*. These samples are listed above in the [calibration samples](#) section.
- 74 603 spectra from a total of 1545 batches from further 375 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 775 spectra of 29 reference samples from the substance/substance group *Waxes / Fats*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Wax, yellow	83038199	20033	30
Caelo	Cocoa butter	81070139	20035 [†]	5
Caelo	Wax, yellow	11285001	20338	40
Caelo	Paraffin, hard	11166911	20532	40
Caelo	Wax, bleached	10364838	20610	40
zu erfassen	Cocoa butter	pending	21014	40
zu erfassen	Cocoa butter	pending	21015	40
Caelo	Cetyl palmitate 15	13295919	21316	20
Caelo	Wax, yellow	13335507	21433 [†]	20
Caelo	Sodium dodecyl sulfate	13411305	21465	60
Caelo	Cetyl palmitate 15	13295919	21522	40
Caelo	Paraffin, microcrystalline	14307104	21682 [†]	20
Caelo	Paraffin, hard	13390413	21731 [†]	20
Caelo	Paraffin, microcrystalline	14307106	21766 [†]	20
Caelo	Cetyl palmitate 15	14351606	21875 [†]	20
Fagron	Hard fat W35	15A07-B12-302751	21880 [†]	20
Caelo	Cetyl palmitate 15	15301703	21984 [†]	20
Caelo	Wax, bleached	14336620	22244 [†]	20
Caelo	Wax, yellow	15317602	22245 [†]	20
Caelo	Cetyl palmitate 15	15301703	22325 [†]	20
Caelo	Paraffin, microcrystalline	154128	22330 [†]	20
Fagron	Hard fat W35	15A07-B12-309245	22338 [†]	20
Caelo	Cocoa butter	14348906	22348 [†]	20
Caelo	Paraffin, hard	15232004	22349 [†]	20
Caelo	Sodium dodecyl sulfate	15344503	22352 [†]	20
Caelo	Hard fat in pastilles	160278	22479 [†]	20
Caelo	Cetyl palmitate 15	160538	22486 [†]	20
Caelo	Wax, bleached	161631	22587	40
Fagron	Hard fat W35	15J08-B04-324959	22806	40

- 80 573 spectra from a total of 1922 batches from further 612 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 1257 spectra from 196 *Apo-Ident* customers from 458 batches from the substance/substance group *Waxes / Fats*.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Caelo	Hard fat in pastilles	14126203	6
Caelo	Hard fat in pastilles	11345905	4
Caelo	Hard fat in pastilles	P182/14	1
Caelo	Hard fat in pastilles	11109616	1
Caelo	Hard fat in pastilles	12158104	5
Caelo	Hard fat in pastilles	13243301	4
Caelo	Hard fat in pastilles	13243411	4
Caelo	Hard fat in pastilles	1909E-02328	1
Bombastus	Hard fat in pastilles	277212	2
Caelo	Wax, yellow	15023006	2
Caelo	Wax, yellow	16038203	2
Caelo	Cocoa butter	11079612	2
Caelo	Cocoa butter	11117816	3
Caelo	Cocoa butter	12342003	8
Caelo	Cocoa butter	12040802	1
Bombastus	Wax, yellow	267702	2
Klenk	Wax, yellow	280A130115	14
Klenk	Wax, yellow	280A140306	8
Klenk	Wax, yellow	280A150528	3
Klenk	Wax, yellow	290A120627	4
Caelo	Wax, yellow	1214816	1
Caelo	Wax, yellow	12124810	7
Caelo	Wax, yellow	11017318	3
Caelo	Wax, yellow	12367916	5
Caelo	Wax, yellow	12367904	4
Caelo	Wax, yellow	12367901	14
Caelo	Wax, yellow	12367916-3429311150	1
Fagron	Wax, yellow	12D23-N05	2
Caelo	Wax, yellow	13031206	8
Caelo	Wax, yellow	13335517	3
Caelo	Wax, yellow	14336607	7
Caelo	Wax, yellow	1436607	1
Caelo	Wax, yellow	14189912	3
Caelo	Wax, yellow	15292003	1
Bombastus	Wax, yellow	279999	1
Bombastus	Wax, yellow	285109	1
Caelo	Wax, yellow	P146/14	1
Caelo	Wax, bleached	14336620	1
Caelo	Wax, bleached	1529003	1
Caelo	Wax, bleached	15292009	2
Anzag	Cetyl palmitate 15	12018208	1
Caelo	Cetyl palmitate 15	13295919	12
Caelo	Cetyl palmitate 15	14351602	2
Caelo	Cetyl palmitate 15	13131911	2
Gehe	Cetyl palmitate 15	8209646	1
Caelo	Cetyl palmitate 15	13131914	3
Caelo	Cetyl palmitate 15	12331916	10
Caelo	Cetyl palmitate 15	13295910	6
Caelo	Cetyl palmitate 15	11021502	1
Caelo	Cetyl palmitate 15	13131906	10
Phönix	Cetyl palmitate 15	13295919	1
Caelo	Cetyl palmitate 15	14041505	1
Caelo	Cetyl palmitate 15	14060705	5
Phoenix	Cetyl palmitate 15	14060705	1
Caelo	Cetyl palmitate 15	14060706	8
Caelo	Cetyl palmitate 15	14060709	3
Caelo	Cetyl palmitate 15	14213705	2
Caelo	Cetyl palmitate 15	14213709	1
Apotärze	Cetyl palmitate 15	1421371	1
Caelo	Cetyl palmitate 15	14213710	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Cetyl palmitate 15	14351601	2
Caelo	Cetyl palmitate 15	14351606	1
Caelo	Cetyl palmitate 15	14351609	2
Caelo	Cetyl palmitate 15	14351612	6
coelo/Sana	Cetyl palmitate 15	14351612	1
Caelo	Cetyl palmitate 15	14351614	1
Caelo	Cetyl palmitate 15	15301703	5
Caelo	Cetyl palmitate 15	15301701	1
Caelo	Cetyl palmitate 15	15301704	2
Caelo	Cetyl palmitate 15	15301705	1
Caelo	Cetyl palmitate 15	15301709	2
Alliance H.	Cetyl palmitate 15	15301709	1
Caelo	Cetyl palmitate 15	15301711	3
Fischer/Phönix	Cetyl palmitate 15	15301711	1
Caelo	Cetyl palmitate 15	15632	1
Caelo	Cetyl palmitate 15	16053803	4
Caelo	Cetyl palmitate 15	16053805	2
Caesar & Loretz GmbH	Cetyl palmitate 15	10068402	2
Caelo	Cetyl palmitate 15	10068410	1
Caelo	Cetyl palmitate 15		1
Sanacorp	Cetyl palmitate 15	8/AKD13	1
Caelo	Cetyl palmitate 15	11042019	2
Gehe	Cetyl palmitate 15	11216007	1
Caelo	Cetyl palmitate 15	12018204	4
Caelo	Cetyl palmitate 15	12018204/Int212191	1
Caelo	Cetyl palmitate 15	12018204c	1
Caelo	Cetyl palmitate 15	12018208	10
Caelo	Cetyl palmitate 15	12018215	1
Caelo	Cetyl palmitate 15	12082901	1
Caesar/Noweda	Cetyl palmitate 15	12124811	2
Caelo	Cetyl palmitate 15	12228805	1
Caelo	Cetyl palmitate 15	12228808	4
Caesar/Noweda	Cetyl palmitate 15	12228801	1
Caelo	Cetyl palmitate 15	122228801/Int212191	1
Euro OTC	Cetyl palmitate 15	12228808	1
Kehr	Cetyl palmitate 15	12228818	1
Caelo	Cetyl palmitate 15	12228818	4
Caelo	Cetyl palmitate 15	1228808	1
Phönix Gotha	Cetyl palmitate 15	12331916	1
Phönix, 04.09.13	Cetyl palmitate 15	12331916	1
Fagron	Cetyl palmitate 15	12C27-N07	2
Caelo	Cetyl palmitate 15	12331919	1
Fagron	Cetyl palmitate 15	12D19-N02	1
Caelo	Cetyl palmitate 15	12D19-No2	1
Fagron	Cetyl palmitate 15	12D19-N02	1
Caelo	Cetyl palmitate 15	1313190	1
Caelo	Cetyl palmitate 15	13131905	2
Alliance Healthcare	Cetyl palmitate 15	13131905	1
Phönix	Cetyl palmitate 15	13131906	1
gepepharm/Kehr	Cetyl palmitate 15	13295919	1
gehe	Cetyl palmitate 15	13295919	1
Caelo	Cetyl palmitate 15	26071201	1
Caelo	Cetyl palmitate 15	30101301	1
Nachprüfung	Cetyl palmitate 15	3012U01241	1
Sanacorp	Cetyl palmitate 15	8/AKD12	1
Fagron	Hard fat in pastilles	12G04-N18	1
Fagron	Hard fat in pastilles	13243301	1
Caelo	Hard fat in pastilles	13243401	1
Caelo	Hard fat in pastilles	13243409	3
Caelo	Hard fat in pastilles	13243418	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hard fat in pastilles	13243412	1
Caelo	Hard fat in pastilles	13243419	2
Caelo	Hard fat in pastilles	13243420	1
Caelo	Hard fat in pastilles	1412602	1
Caelo	Hard fat in pastilles	14126202	5
Caelo	Hard fat in pastilles	14126209	2
Caelo	Hard fat in pastilles	14126205	1
Caelo	Hard fat in pastilles	14126204	2
Caelo	Hard fat in pastilles	14126210	3
Caelo	Hard fat in pastilles	14126216	2
Caelo	Hard fat in pastilles	14126217	2
Caelo	Hard fat in pastilles	14338704	2
Caelo	Hard fat in pastilles	14338703	2
Caelo	Hard fat in pastilles	14338706	1
Caelo	Hard fat in pastilles	14338707	3
Caelo	Hard fat in pastilles	14338708	2
Fagron	Hard fat in pastilles	14L01-B06-303380	2
Caelo	Hard fat in pastilles	14338711	2
Cae4lo	Hard fat in pastilles	15185002	1
Caelo	Hard fat in pastilles	15185002	10
Caelo	Hard fat in pastilles	15111402	1
Caelo	Hard fat in pastilles	15185003	6
Rondell Apotheke	Hard fat in pastilles	15185002	1
Caelo	Hard fat in pastilles	15185005	8
Caelo	Hard fat in pastilles	15185009	2
Caelo	Hard fat in pastilles	1518505	1
Fagron	Hard fat in pastilles	15F03-B06	2
Fagron	Hard fat in pastilles	15F03-B06-308708	3
Caelo	Hard fat in pastilles	16021503	1
Caelo	Hard fat in pastilles	16027801	2
Bombastus	Hard fat in pastilles	287287	1
Bombastus	Hard fat in pastilles	293848	5
Caelo	Hard fat in pastilles	17041401	1
Bombastus	Hard fat in pastilles	302709	1
Bombastus	Hard fat in pastilles	263489	1
Caelo	Hard fat in pastilles	11109617	1
Caelo	Hard fat in pastilles	11285001	2
Caelo	Hard fat in pastilles	11109623	3
Caelo	Hard fat in pastilles	10158813	1
Purren Apotheke	Hard fat in pastilles	10I03-N08	1
sanacorp	Hard fat in pastilles	267773	1
Caelo	Hard fat in pastilles	7101304	1
Caesar&Loretz GmbH D-40...	Hard fat in pastilles	11109617	1
Caelo	Hard fat in pastilles	11345904	1
Noweda	Hard fat in pastilles	11345909	1
Caelo	Hard fat in pastilles	11345909	2
Caelo	Hard fat in pastilles	11345917	4
Caelo	Hard fat in pastilles	11345918	8
phönix, 19.12.2012	Hard fat in pastilles	11345918	1
Anzag 17.01.2013	Hard fat in pastilles	11345918	1
Caesar & Loretz GmbH, 4...	Hard fat in pastilles	11345918	1
Gehe	Hard fat in pastilles	11345918	1
Caelo	Hard fat in pastilles	1135917	2
Caelo	Hard fat in pastilles	12111204	1
Caesar & Loretz GmbH D-...	Hard fat in pastilles	12158104	1
Caelo	Hard fat in pastilles	12158109	3
Caelo	Hard fat in pastilles	12158114	4
Fagron	Hard fat in pastilles	12158115	2
Caelo	Hard fat in pastilles	12158115	6
Caelo	Hard fat in pastilles	12158122	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Hard fat in pastilles	12K01-N12	2
Gehe	Hard fat in pastilles	13243403	1
Caelo	Hard fat in pastilles	13243403	6
Caesar & Loretz GmbH, 4...	Hard fat in pastilles	13243403	1
Caelo	Hard fat in pastilles	13243414	1
Fagron	Hard fat in pastilles	13D10-N06	1
Sanacorp	Hard fat in pastilles	14126203	1
Bombastus	Hard fat in pastilles	273759	1
Caelo	Hard fat in pastilles	2511A-02328	1
Caelo	Hard fat in pastilles	24011302	1
Phönix	Hard fat in pastilles	277212	1
China Medica	Hard fat in pastilles	3244303	1
Fargon	Hard fat in pastilles	41319264	1
Bombastus	Hard fat in pastilles	60084402	1
Caelo	Hard fat in pastilles	90915429	1
Caelo	Hard fat in pastilles		1
Noweda	Hard fat W35	16027801	1
Fagron	Hard fat W35	15J08-B04	1
Caelo	Paraffin, hard	10194101	2
Fagron	Hard fat W35	3914E-02328	1
Unisan	Paraffin, hard	11166911	1
Caelo	Paraffin, hard	123654	1
Caelo	Paraffin, hard	13109213	5
Caelo	Paraffin, hard	13109214	6
Caelo	Paraffin, hard	13109224	3
Caelo	Paraffin, hard	13390406	4
Euro OTC	Paraffin, hard	13109224	1
Caelo	Paraffin, hard	13390408	1
Caelo	Paraffin, hard	13390413	1
Caelo	Paraffin, hard	13390415	2
Phoenix goettingen 09.05	Paraffin, hard	13390415	1
Caelo	Paraffin, hard	14126202	1
Caelo	Paraffin, hard	14286504	1
Caelo	Paraffin, hard	14286511	2
Caelo	Paraffin, hard	14286517	1
Caelo	Paraffin, hard	1523002	1
Caelo	Paraffin, hard	15232004	3
Caelo	Paraffin, hard	152320004	1
Caelo	Paraffin, hard	15295405	3
GEHE	Paraffin, hard	15295409	1
Phoenix	Paraffin, hard	15295410	1
Caelo	Paraffin, hard	15295411	2
Caelo	Paraffin, hard	15295414	4
Caelo	Paraffin, hard	10194106	1
Caelo	Paraffin, hard	11021202	1
Caelo	Paraffin, hard	11166911	1
Kehr	Paraffin, hard	11166916	1
Caelo	Paraffin, hard	11363205	1
Noweda	Paraffin, hard	11363206	1
Caelo	Paraffin, hard	11363206	1
Caelo	Paraffin, hard	11363220	3
Caelo	Paraffin, hard	12252205	2
Caelo	Paraffin, hard	12252206	1
Caelo	Paraffin, hard	12252211	5
Caelo	Paraffin, hard	12252221	2
Caelo	Paraffin, hard	13109203	3
Caelo	Paraffin, hard	13109221	1
Caelo	Cocoa butter	13140404	23
Caelo	Cocoa butter	13140405	4
Caelo	Cocoa butter	13140407	21

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Cocoa butter	13140409	1
Caelo	Cocoa butter	13140409	1
Caelo	Cocoa butter	13292001	2
Caelo	Cocoa butter	13292007	10
Caelo	Cocoa butter	13292011	2
Caelo	Cocoa butter	13292012	3
Caelo	Cocoa butter	13292013	7
Caelo	Cocoa butter	14045104	21
Caelo	Cocoa butter	14123611	5
Caelo	Cocoa butter	14123617	3
Caelo	Cocoa butter	14123620	3
Caelo	Cocoa butter	14348906	6
AHD	Cocoa butter	14348906	1
Caelo	Cocoa butter	14348908	1
Caelo	Cocoa butter	15088903	1
Caelo	Cocoa butter	15088904	1
Sanacorp	Cocoa butter	AKD28	1
Herbasinica	Cocoa butter		2
Caelo	Cocoa butter	11034718	1
Caelo	Cocoa butter	11034719	1
Caelo	Cocoa butter	11117806	2
Euro OTC	Cocoa butter	11079604	1
Caelo	Cocoa butter	11117813	1
Noweda	Cocoa butter	11117813	2
Caelo	Cocoa butter	11117820	1
Caelo	Cocoa butter	12040803	2
Caelo	Cocoa butter	12040807	1
Caelo	Cocoa butter	12040810	1
Caelo	Cocoa butter	12270201	2
Caelo	Cocoa butter	12270202	26
Caelo	Cocoa butter	12270203	5
Caelo	Cocoa butter	12270205	5
Caelo	Cocoa butter	12270206	11
Caelo	Cocoa butter	12270210	2
Caelo	Cocoa butter	12270209	1
Caelo	Cocoa butter	12270212	10
Caelo	Cocoa butter	12342004	1
Anzag	Cocoa butter	12342004	1
Caelo	Cocoa butter	13027202	5
Caelo	Cocoa butter	13027204	4
Caelo	Cocoa butter	13027207	5
Sanacorp	Cocoa butter	13027207	1
Caelo	Cocoa butter	13027221	5
gehe 26.08.13	Cocoa butter	13027221	1
Caelo	Cocoa butter	13027224	4
Caelo	Cocoa butter	13027226	4
Caelo	Cocoa butter	13027227	3
Caelo	Cocoa butter	13140401	1
Caelo	Cocoa butter	13140402	1
Caelo	Cocoa butter	13140406	3
Caelo	Cocoa butter	13292006	1
Caelo / Noweda	Cocoa butter	13292011	1
Caelo	Cocoa butter	1392013	1
Spinnrad	Cocoa butter	512300202	1
Caelo	Cocoa butter	71326048	2
Sanacorp	Cocoa butter	AKD27	1
Caelo	Paraffin, microcrystalline	52622395	1
Caelo	Paraffin, microcrystalline	14307106	1
Caelo	Sodium dodecyl sulfate	12153010	3
Gehe	Sodium dodecyl sulfate	14127404	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium dodecyl sulfate	13411302	1
Caelo	Sodium dodecyl sulfate	14127411	1
Caelo	Sodium dodecyl sulfate	13411304	1
Caelo	Sodium dodecyl sulfate	13411305	3
Caelo	Sodium dodecyl sulfate	14224206	1
Caelo	Sodium dodecyl sulfate	14283904	3
Caelo	Sodium dodecyl sulfate	15095404	1
Caelo	Sodium dodecyl sulfate	15095403	1
Caelo	Sodium dodecyl sulfate	15119907	1
Caelo	Sodium dodecyl sulfate	15344503	2
Caelo	Sodium dodecyl sulfate	15344510	1
Caelo	Sodium dodecyl sulfate	15344511	1
Caelo	Sodium dodecyl sulfate	26031508	1
Caelo	Sodium dodecyl sulfate	13014606	1
Caelo	Sodium dodecyl sulfate	13014604	2
Caelo	Sodium dodecyl sulfate	13099006	3
Caelo	Sodium dodecyl sulfate	13099008	1
Caelo	Sodium dodecyl sulfate	13099011	2
Caelo	Sodium dodecyl sulfate	14127406	1
Sanacorp	Sodium dodecyl sulfate	5/AKD1	1
Sanacorp	Sodium dodecyl sulfate	5/AKD6	1
Caelo	Sodium dodecyl sulfate	11220208	1
Caelo	Sodium dodecyl sulfate	12153003	1
Caelo	Sodium dodecyl sulfate	12153019	1
Caelo	Sodium dodecyl sulfate	12153004	1
Caelo	Cocoa butter	515A-03176	1
Gutenberg-Apotheke	Cocoa butter	13292007	1
Caelo	Cocoa butter	13292015	1
Caelo	Cocoa butter	13292019	1
Caelo	Cocoa butter	14304703	1
Caelo	Cocoa butter	16316501	2
Caelo	Cocoa butter	11079607	2
Caesar & Lorenz	Cocoa butter	13140404	1
Caelo	Paraffin, microcrystalline	13274303	5
Caelo	Paraffin, microcrystalline	3042012M1	1
Caelo	Paraffin, microcrystalline	14307108	1
Caelo	Paraffin, microcrystalline	7111201	1
Caelo	Paraffin, microcrystalline	7111202	1
Caelo	Paraffin, microcrystalline	12065104	1
Caelo	Paraffin, microcrystalline	12095101	1
Noweda	Paraffin, microcrystalline	12266304	1
Caelo	Paraffin, microcrystalline	12266304	1
Caelo	Paraffin, microcrystalline	12355001	1
Phönix	Paraffin, microcrystalline	13274301	1
Caelo	Paraffin, microcrystalline	30101202	1
Caelo	Paraffin, hard	14286503	1
Caelo	Paraffin, hard	15295410	1
Caelo	Paraffin, hard	1136206	1
Caelo	Hard fat in pastilles	20071501	1
Caelo	Hard fat in pastilles	10356001	1
Fagron	Hard fat in pastilles	209314	2
Caelo	Hard fat in pastilles	13243416	1
Fagron	Hard fat in pastilles	12I04-N11	1
Klenk	Wax, yellow	280A120627	2
Alliance	Wax, yellow	280A130115	1
Noweda	Wax, yellow	280A120627	2
Klenk	Wax, yellow	280-A120627	1
Alliance Health 14.04.2...	Wax, yellow	280A130115	1
Klenk	Wax, yellow	280A13011A	1
Klenk	Wax, yellow	282A120627	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Wax, yellow	282A140306	1
Klenk	Wax, yellow	290A140903	3
Klenk	Wax, yellow	290A081210	1
Klenk	Wax, yellow	290A150716	1
Klenk	Wax, yellow	290A110803	1
Alliance Healthcare	Wax, yellow	290A120627	1
Caelo	Wax, yellow	6111407	1
Caelo	Wax, yellow	4031403	1
Caelo	Wax, yellow	10121302	1
Finze	Wax, yellow	10145002	1
Caelo	Wax, yellow	10145019	1
Caelo	Wax, yellow	10364810	1
Caelo	Wax, yellow	10364814	1
Caelo	Wax, yellow	10364829	1
Caelo	Wax, yellow	10364837	1
Kehr	Wax, yellow	10F03-N09	1
Caelo	Wax, yellow	11017314	1
Caelo	Wax, yellow	110124	1
Caelo	Wax, yellow	11017315	1
Caelo	Wax, yellow	11101207	1
Caesar & Loretz GmbH, 4. . .	Wax, yellow	11285008	1
Caelo	Wax, yellow	11285008	1
Caelo	Wax, yellow	11285014	2
Caelo	Wax, yellow	11285015	1
Noweda	Wax, yellow	11308305	1
Caelo	Wax, yellow	11308305	1
Caelo	Wax, yellow	11308311	2
Euro OTC	Wax, yellow	1201012-01	1
Sanacorp	Wax, yellow		1
Gehe	Wax, yellow	12079412	1
Caelo	Wax, yellow	12041303	1
Caelo	Wax, yellow	12091404	1
Caelo	Wax, yellow	12124801	7
Noweda	Wax, yellow	12124801	1
Caelo	Wax, yellow	12124802	2
Caelo	Wax, yellow	121248024-2015	1
Caelo	Wax, yellow	12124805	6
Großhandel	Wax, yellow	12124805	2
Caelo	Wax, yellow	12124806	1
Caelo	Wax, yellow	12124807	3
Caelo	Wax, yellow	12124811	1
Caelo	Wax, yellow	12124812	8
Caelo	Wax, yellow	12124814	2
Caelo	Wax, yellow	12124816	1
Caelo	Wax, yellow	12124817	2
Caelo	Wax, yellow	1214812	1
Caelo	Wax, yellow	12257002	3
Caelo	Wax, yellow	12257004	2
Caelo	Wax, yellow	12257009	7
Caelo	Wax, yellow	12257012	4
Hirsch	Wax, yellow	12257012	1
Caelo	Wax, yellow	12257022	1
Caelo	Wax, yellow	12330116	1
Phönix	Wax, yellow	12367901	1
Caesar & Loretz GmbH, 4. . .	Wax, yellow	12367901	1
Phönix	Wax, yellow	12367904	1
gehe 16.08.13	Wax, yellow	12367904	1
Caelo	Wax, yellow	12367910	8
AHD , 04.09.13	Wax, yellow	12367910	1
Gehe	Wax, yellow	12367910	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH, 4...	Wax, yellow	12367910	1
Sanacorp	Wax, yellow	12367910	1
Caesar & Loretz GmbH	Wax, yellow	12367910	1
Caelo	Wax, yellow	12367911	2
Caelo	Wax, yellow	12367912	4
AHD,18.10.13	Wax, yellow	12367915	1
Caelo	Wax, yellow	12367915	10
Phönix	Wax, yellow	12367915	1
Caelo	Wax, yellow	12367921	1
Fagron	Wax, yellow	12K20B05287421	1
PHOENIX 24.07.2014	Wax, yellow	13001206	1
Caelo	Wax, yellow	13031201	6
Phönix	Wax, yellow	13031206	1
Caelo	Wax, yellow	13031220	3
Caesar/Noweda	Wax, yellow	13031220	1
Caelo	Wax, yellow	13031222	4
Caelo	Wax, yellow	13031231	8
Ichthyol	Wax, yellow	13031239	1
Caelo	Wax, yellow	13031239	8
Caelo	Wax, yellow	13031240	1
Caelo	Wax, yellow	13051401	1
Caelo	Wax, yellow	13061503	1
Caelo	Wax, yellow	13335502	7
Großhandel	Wax, yellow	13335502	1
Sanacorp	Wax, yellow	13335502	1
Cealo/Gehe	Wax, yellow	13335502	1
GEHE	Wax, yellow	13335502	1
Caelo	Wax, yellow	13335503	6
Caelo	Wax, yellow	13335505	1
Caelo	Wax, yellow	13335507	4
Caelo	Wax, yellow	13335508	1
Caelo	Wax, yellow	13335509	3
Klenk	Wax, yellow	13335513	1
Caelo	Wax, yellow	13335513	3
Caelo	Wax, yellow	13335516	3
Caelo	Wax, yellow	1335503	1
Caelo	Wax, yellow	13378603	1
Sanacorp	Wax, yellow	13378619	1
Caelo	Wax, yellow	13378619	16
Caelo	Wax, yellow	13378630	2
Caelo	Wax, yellow	13378634	6
Caelo	Wax, yellow	13378639	3
Caelo	Wax, yellow	13378640	2
Fagron	Wax, yellow	13804-N04	1
Fagron	Wax, yellow	13B04-N04	2
Fagron	Wax, yellow	13L02-B01-294113	1
Fagron	Wax, yellow	13L02-B01-291452	1
Fagron	Wax, yellow	13L02-B01-294114	1
Euro OTC	Wax, yellow	1407013-01	1
Euroo	Wax, yellow	1407013-01	1
Caelo	Wax, yellow	1418915	1
Caelo	Wax, yellow	14189901	2
Caelo	Wax, yellow	14189902	2
Caelo	Wax, yellow	14189906	1
Caelo	Wax, yellow	14189907	3
Caelo	Wax, yellow	14189909	3
Caelo	Wax, yellow	14189913	2
Caelo	Wax, yellow	14189914	4
Caelo	Wax, yellow	14189917	1
Caelo	Wax, yellow	14189919	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Wax, yellow	14189920	1
Caelo	Wax, yellow	14336605	1
Caelo	Wax, yellow	14336608	1
Caelo	Wax, yellow	14336609	2
Fagron	Wax, yellow	14336616	1
Caelo	Wax, yellow	14336616	5
Caelo	Wax, yellow	14336618	1
Caelo	Wax, yellow	14336620	2
Caelo	Wax, yellow	1436616	1
Fagron	Wax, yellow	14G07-B04-300495	2
Caelo	Wax, yellow	14G07-B04-300495	1
Caelo	Wax, yellow	15022902	3
Caelo	Wax, yellow	15022903	1
Caelo	Wax, yellow	15022904	1
Caelo	Wax, yellow	15022908	2
Noweda	Wax, yellow	15023002	1
Caelo	Wax, yellow	15023003	3
Caelo	Wax, yellow	15023004	4
Phoenix goettingen 08.05	Wax, yellow	15098901	1
Caelo	Wax, yellow	15041301	1
Caelo	Wax, yellow	152920004	1
Caelo	Wax, yellow	15098902	1
Caelo	Wax, yellow	15292004	8
Caelo	Wax, yellow	15292014	1
Caelo	Wax, yellow	15292009	1
Caelo	Wax, yellow	15317601	2
Caelo	Wax, yellow	15317602	2
Caelo	Wax, yellow	15317603	3
Caelo	Wax, yellow	15317604	1
Caelo	Wax, yellow	16038201	1
Caelo	Wax, yellow	17011403	1
Caelo	Wax, yellow	17041402	1
Caelo	Wax, yellow	17121201	1
Caelo	Wax, yellow	17121202	1
Caelo	Wax, yellow	18121201	1
Caelo	Wax, yellow	20031516	1
Caelo	Wax, yellow	20031517	1
Caelo	Wax, yellow	2179	1
Caelo	Wax, yellow	20071503	1
Caelo	Wax, yellow	22071301	1
Caelo	Wax, yellow	26091302	1
Bombastus	Wax, yellow	270682	3
Caelo	Wax, yellow	28011501	1
Caelo	Wax, yellow	30011407	1
Caelo	Wax, yellow	30101308	1
Caelo	Wax, yellow	4910A-01239	1
Klenk	Wax, bleached	280A150528	4
Klenk	Wax, bleached	280A160311	1
Caelo	Wax, bleached	280A150528	1
Klenk	Wax, bleached	290A150716	1
Phoenix	Wax, bleached	15292003	1
Caelo	Wax, bleached	15292003	2
Caelo	Wax, bleached	15292005	2
Caelo	Wax, bleached	15292014	3
Caelo	Wax, bleached	15292022	1
Fagron	Wax, bleached	16A28-B10-322948	1
Fagron	Wax, bleached	2155	1
Caelo	Wax, yellow	14189915	1
Caelo	Wax, yellow	15098901	1
Caelo	Wax, yellow	15317607	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Wax, yellow	15317608	3
Caelo	Wax, yellow	15317609	5
Phönix	Wax, yellow	15317609	1
Caelo	Wax, yellow	15317610	3
Caelo	Wax, yellow	15317613	3
Caesar & Loretz	Wax, yellow	15317613	1
Caelo	Wax, yellow	1595	1
Caesar & Loretz	Wax, yellow	16038201	1
Caelo	Wax, yellow	16038202	2

- 54 744 spectra from 335 *Apo-Ident* customers from a total of 20 158 batches from a further 675 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Waxes / Fats* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Waxes / Fats* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	1275	0	74 603
Type B	0	673	102	80 573
Type C	0	1071	186	54 744

The substance/substance group *Waxes / Fats* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 99.5294 %)
Type B	100.0000 % (> 99.9853 %)	86.8387 % (> 86.4516 %)
Type C	100.0000 % (> 99.8622 %)	85.2029 % (> 84.9642 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20035	20035	0.00	67.54
20174	20339	6.27	45.60
20237	20986	5.25	35.89
20339	20339	0.00	41.09
20400	21682	7.06	36.82
20461	20461	0.00	49.42
20747	22767	9.69	36.97
20865	20865	0.00	36.30
20986	20986	0.00	36.62
21067	20339	1.42	43.13
21433	22767	7.13	33.54
21482	20035	6.91	53.56
21483	21483	0.00	30.36
21521	20339	16.12	32.28
21682	21682	0.00	36.33
21731	22349	1.91	39.87
21766	22330	2.97	36.33
21875	21984	4.21	34.36
21880	21880	0.00	43.70
21984	21984	0.00	35.96
22244	22767	9.30	36.78
22245	22767	5.28	33.39
22325	21984	2.74	34.43
22330	22330	0.00	37.15
22338	21880	4.75	44.22
22348	20035	7.27	56.26
22349	22349	0.00	40.01
22352	20986	10.68	36.35
22479	22479	0.00	43.00
22486	22486	0.00	32.49
22767	22767	0.00	31.14
22956	22767	15.64	38.09

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Wool alcohols**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20495-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Wool alcohols; Alcoholes adipis lanae; Alcoholes lanae

Special notes

When selecting the *Wool alcohols* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Wool alcohols*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Wool alcohols	11214708	20495	40	AR-13-FG-001851-01
Caelo	Wool alcohols	13380601	21520	40	1412037
Caelo	Wool alcohols	153703	22328	40	20151111*
Caelo	Wool alcohols	153703	22329	40	20151111*

Validation samples

A total of 213 227 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 *Wool alcohols*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Wool alcohols*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Wool alcohols	153703	22328 [†]	20
Caelo	Wool alcohols	153703	22329 [†]	20

- 81 308 spectra from a total of 1946 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 8 *Apo-Ident* customers from 9 batches from the substance/substance group *Wool alcohols*.

Supplier	Substance	Batch	Spectra
Caelo	Wool alcohols	13071502	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Wool alcohols	15304505	1
Caelo	Wool alcohols	12340505	1
Cealo/ Noweda	Wool alcohols	13380601	1
Caelo	Wool alcohols	11011401	1
Caelo	Wool alcohols	23101408	1
Caelo	Wool alcohols	13226408	1
Caelo	Wool alcohols	13083906	2
Caelo	Wool alcohols	13083912	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 602 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Wool alcohols* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Wool alcohols* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	40	0	81 308
Type C	0	9	1	55 991

The substance/substance group *Wool alcohols* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 85.0000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20495	20495	0.00	40.07
21520	21520	0.00	53.13
22328	22328	0.00	38.80
22329	22329	0.00	38.99

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Xylitol**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20994-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xylitol; Xylitolum

Special notes

When selecting the *Xylitol* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Xylitol*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Xylitol	14G04-B04-298356	21754	40	AR-15-FG-008046-01
Caelo	Xylitol	14068206	21755	40	20140317
Caelo	Xylitol	15135405	22248	40	20150417
Fagron	Xylitol	14G04-B04-303524	22254	40	20140919

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *Xylitol*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 320 spectra of 10 reference samples from the substance/substance group *Xylitol*.

Supplier	Substance	Batch	Sample ID	Spectra
Dr. Pfeifer	Xylitol	pending	20633	40
Dr. Pfeifer	Xylitol	10BIZU130702	20994	40
Dr. Pfeifer	Xylitol	130610	21099	40
Fagron	Xylitol	14G04-B04-298356	21754 [†]	20
Caelo	Xylitol	14068206	21755 [†]	20
Caelo	Xylitol	15135405	22248 [†]	20
Fagron	Xylitol	14G04-B04-303524	22254 [†]	20
Caelo	Xylitol	15388101	22578	40
Caelo	Xylitol	15135405	22579	40
Caelo	Xylitol	163174	23061	40

- 81 028 spectra from a total of 1939 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 10 *Apo-Ident* customers from 16 batches from the substance/substance group *Xylitol*.

Supplier	Substance	Batch	Spectra
Caelo	Xylitol	13230302	2
Caelo	Xylitol	12240612	1
Caelo	Xylitol	13230305	1
Caelo	Xylitol	13230315	1
Caelo	Xylitol	14061401	1
Fagron	Xylitol	13H28N10	1
Caelo	Xylitol	14G04-B04-298356	2
Fagron	Xylitol	14G04-B04-303524	2
Caelo	Xylitol	5112I-02787	1
Caelo	Xylitol	12039003	1
Fagron	Xylitol	13/23-N06	1
Caelo	Xylitol	13230309	1
Fagron	Xylitol	13H28-N10	1
Caelo	Xylitol	15388104	1
Caelo	Xylitol	15135401	1
Caelo	Xylitol	3314M-02787	1

- 55 982 spectra from 335 *Apo-Ident* customers from a total of 20 595 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xylitol* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylitol* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	320	0	81 028
Type C	0	19	0	55 982

The substance/substance group *Xylitol* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 98.1250 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21754	21754	0.00	22.97
21755	21754	6.51	33.13
22248	21754	6.66	32.87
22254	21754	1.99	23.62

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Xylometazoline hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20025-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xylometazoline hydrochloride; Xylometazolini hydrochloridum; Xylometazolinum hydrochloricum

Special notes

When selecting the *Xylometazoline hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Xylometazoline hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Xylometazoline h...	91206209	20025	30	I 2009 000 289
Caelo	Xylometazoline h...	13344901	21516	40	1501655
Caelo	Xylometazoline h...	13344901	21517	40	20131119
Fagron	Xylometazoline h...	13I18-B03-295481	21722	40	AR-15-FG-007785-01
Fagron	Xylometazoline h...	14K19-B05-305006	21927	40	20141128
Caelo	Xylometazoline h...	13344901	21517SI	40	20131119
Fagron	Xylometazoline h...	14K19-B05-305006	21927SI	40	20141128

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 270 spectra of 7 reference samples from the substance/substance group *Xylometazoline hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 608 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 130 spectra of 7 reference samples from the substance/substance group *Xylometazoline hydrochloride*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Xylometazoline hydrochloride	91206209	20025 [†]	10
Caelo	Xylometazoline hydrochloride	13344901	21516 [†]	20
Caelo	Xylometazoline hydrochloride	13344901	21517 [†]	20
Fagron	Xylometazoline hydrochloride	13I18-B03-295481	21722 [†]	20
Fagron	Xylometazoline hydrochloride	14K19-B05-305006	21927 [†]	20
Caelo	Xylometazoline hydrochloride	13344901	21517SI [†]	20
Fagron	Xylometazoline hydrochloride	14K19-B05-305006	21927SI [†]	20

- 81 218 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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*.

- 76 spectra from 53 *Apo-Ident* customers from 34 batches from the substance/substance group *Xylometazoline hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	Xylometazoline hydrochloride	2031502	1
Caelo	Xylometazoline hydrochloride	10118821	3
Caelo	Xylometazoline hydrochloride	12287203	10
Caelo	Xylometazoline hydrochloride	13171205	2
Caelo	Xylometazoline hydrochloride	12287212	2
Caelo	Xylometazoline hydrochloride	13171202	8
Fagron	Xylometazoline hydrochloride	1318-B03-295479	1
Caelo	Xylometazoline hydrochloride	13344901	1
Caelo	Xylometazoline hydrochloride	15037906	1
Caelo	Xylometazoline hydrochloride	13344908	1
Fagron	Xylometazoline hydrochloride	13I09-N02	1
Sanacorp	Xylometazoline hydrochloride	15037906	1
Caelo	Xylometazoline hydrochloride	15037907	1
Anzag	Xylometazoline hydrochloride	15037907	2
Caelo	Xylometazoline hydrochloride	15037910	2
Caelo	Xylometazoline hydrochloride	15037912	1
Caelo	Xylometazoline hydrochloride	15292803	3
Caelo	Xylometazoline hydrochloride	15292804	4
Fagron	Xylometazoline hydrochloride	15Jo6-B99-313751	1
Caelo	Xylometazoline hydrochloride	9278404	1
Caelo	Xylometazoline hydrochloride	16074201	2
Caelo	Xylometazoline hydrochloride	9276404	1
Gehe	Xylometazoline hydrochloride	10118802	1
Caelo	Xylometazoline hydrochloride	10118805	1
Noweda	Xylometazoline hydrochloride	12027902	1
Caelo	Xylometazoline hydrochloride	12027906	3
Anzag	Xylometazoline hydrochloride	12027911	1
Caelo	Xylometazoline hydrochloride	12287201	2
Caelo	Xylometazoline hydrochloride	1207906	1
Noweda	Xylometazoline hydrochloride	12287203	1
Caelo	Xylometazoline hydrochloride	12287204	2
Caelo	Xylometazoline hydrochloride	12287210	7
Fagron	Xylometazoline hydrochloride	12287210	1
Caelo	Xylometazoline hydrochloride	12287213	1
Fagron	Xylometazoline hydrochloride	12G31-N01	1
Fagron	Xylometazoline hydrochloride	13171203	1
Fagron	Xylometazoline hydrochloride	13E06-N11	1
Caelo	Xylometazoline hydrochloride	24111202	1

- 55 925 spectra from 335 *Apo-Ident* customers from a total of 20 577 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xylometazoline hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylometazoline hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	270	0	75 608
Type B	0	130	0	81 218
Type C	0	74	2	55 925

The substance/substance group *Xylometazoline hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.7778 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.3846 %)
Type C	100.0000 % (> 99.8622 %)	97.3684 % (> 93.4211 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20025	20025	0.00	12.33
21516	21516	0.00	13.34
21517	21516	3.99	12.92
21722	21722	0.00	13.35
21927	21722	5.96	13.06

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Xylose**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20517-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Xylose; Xylosum

Special notes

When selecting the *Xylose* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Xylose*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	Xylose	11L09-N11	20517	40	AR-13-FG-008658-01
Caelo	Xylose	14218902	21606	40	AR-14-FG-013086-01
Fagron	Xylose	13A31-B40-292395	21763	40	20140407

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 120 spectra of 3 reference samples from the substance/substance group *Xylose*. These samples are listed above in the [calibration samples](#) section.
- 75 758 spectra from a total of 1573 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 120 spectra of 4 reference samples from the substance/substance group *Xylose*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Xylose	13133402	20868	40
Caelo	Xylose	14218902	21606 [†]	20
Fagron	Xylose	13A31-B40-292395	21763 [†]	20
Caelo	Xylose	162064	22758	40

- 81 228 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 34 spectra from 11 *Apo-Ident* customers from 23 batches from the substance/substance group *Xylose*.

Supplier	Substance	Batch	Spectra
Caelo	Xylose	5031501	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
Fagron	Xylose	5031510	1
Eigenherstellung	Xylose	80414HJK01	1
Fagron	Xylose	80414PJK01	1
Gehe	Xylose	1000110821	1
Fagron	Xylose	10121401	1
Caelo	Xylose	11031501	1
Gehe	Xylose	11J06-N01	1
Caelo	Xylose	12120101	1
Caelo	Xylose	12120102	3
Caelo	Xylose	13133404	2
Caelo	Xylose	13133410	1
Caelo	Xylose	13133414	3
Fagron	Xylose	13133415	1
Phoenix Goettin	Xylose	13133422	1
Phoenix 20.06.2014	Xylose	13A31-B04-292396	1
Caelo	Xylose	14218903	1
Fagron	Xylose	14E-B03300658	1
Ebert & Jacobi 12.07...	Xylose	16002301	2
Caelo	Xylose	16002302	2
Falcento	Xylose	2013051801	1
Gehe	Xylose	xrf12020201	5
Fagron	Xylose	28111405	1

- 55 967 spectra from 335 *Apo-Ident* customers from a total of 20 588 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Xylose* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Xylose* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	120	0	75 758
Type B	0	120	0	81 228
Type C	0	34	0	55 967

The substance/substance group *Xylose* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 95.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 95.0000 %)
Type C	100.0000 % (> 99.8622 %)	100.0000 % (> 82.3529 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20517	20517	0.00	60.14
21606	21606	0.00	60.70
21763	21606	7.47	60.34

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Zinc acetate dihydrate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20398-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zinc acetate dihydrate; Zinci acetat dihydricus; Zincum aceticum purum

Special notes

When selecting the *Zinc acetate dihydrate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Zinc acetate dihydrate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Caelo	Zinc acetate dihyd...	10302505	20398	40	AR-13-FG-001886-01
Caelo	Zinc acetate dihyd...	11354901	20492	40	20111222
Caelo	Zinc acetate dihyd...	15383301	22728	40	20151127
Caelo	Zinc acetate dihyd...	153833	23030	40	20151127*

Validation samples

A total of 213 227 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 *Zinc acetate dihydrate*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long 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 *Zinc acetate dihydrate*.

Supplier	Substance	Batch	Sample ID	Spectra
Caelo	Zinc acetate dihydrate	11354902	20504	40
Caelo	Zinc acetate dihydrate	170204	23031	40

- 81 268 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 9 *Apo-Ident* customers from 8 batches from the substance/substance group *Zinc acetate dihydrate*.

Supplier	Substance	Batch	Spectra
Caelo	Zinc acetate dihydrate	12316405	1
Fiebig	Zinc acetate dihydrate	211172/2	1

continued on the next page

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Zinc acetate dihydrate	12134801	1
Caelo	Zinc acetate dihydrate	15160804	1
Caelo	Zinc acetate dihydrate	12134803	1
Caelo	Zinc acetate dihydrate	12316403	2
Gehe	Zinc acetate dihydrate	12134803	1
Caelo	Zinc acetate dihydrate	12316404	1
Caelo	Zinc acetate dihydrate	71359347	1

- 55 991 spectra from 335 *Apo-Ident* customers from a total of 20 603 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zinc acetate dihydrate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zinc acetate dihydrate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	80	0	81 268
Type C	0	9	1	55 991

The substance/substance group *Zinc acetate dihydrate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 92.5000 %)
Type C	100.0000 % (> 99.8623 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20398	20398	0.00	47.41
20492	20398	19.56	55.30
22728	23030	2.75	47.20
23030	23030	0.00	47.45

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **Zinc gluconate**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20379-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

Zinc gluconate; Zinci gluconas; Zincum gluconicum

Special notes

When selecting the *Zinc gluconate* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *Zinc gluconate*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Euro OTC	Zinc gluconate	1111002-01	20379	40	AR-12-FG-008661-01
Euro OTC	Zinc gluconate	1407033-02	21709	40	20140902
Euro OTC	Zinc gluconate	1508007	21882	40	20150827*
Euro OTC	Zinc gluconate	1603035	22513	40	20160427*
Caelo	Zinc gluconate	170165	23034	40	20170125*

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 200 spectra of 5 reference samples from the substance/substance group *Zinc gluconate*. These samples are listed above in the [calibration samples](#) section.
- 75 678 spectra from a total of 1571 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 160 spectra of 5 reference samples from the substance/substance group *Zinc gluconate*.

Supplier	Substance	Batch	Sample ID	Spectra
Euro OTC	Zinc gluconate	1407033-02	21709 [†]	20
Euro OTC	Zinc gluconate	1508007	21882 [†]	20
Caelo	Zinc gluconate	161788	22619	40
Euro OTC	Zinc gluconate	1606018	22700	40
Euro OTC	Zinc gluconate	1701017	22994	40

- 81 188 spectra from a total of 1942 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 3 spectra from 2 *Apo-Ident* customers from 3 batches from the substance/substance group *Zinc gluconate*.

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Supplier	Substance	Batch	Spectra
Euro OTC	Zinc gluconate	1405011-01	1
Euro OTC	Zinc gluconate	1312010-01	1
Fagron	Zinc gluconate	14J30-B06-300520	1

- 55 998 spectra from 335 *Apo-Ident* customers from a total of 20 608 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *Zinc gluconate* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *Zinc gluconate* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	200	0	75 678
Type B	0	160	0	81 188
Type C	0	3	0	55 998

The substance/substance group *Zinc gluconate* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 97.0000 %)
Type B	100.0000 % (> 99.9853 %)	100.0000 % (> 96.2500 %)
Type C	100.0000 % (> 99.8626 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20379	20379	0.00	29.51
21709	20379	4.16	24.43

continued on the next page

continued from previous page

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
21882	21882	0.00	26.94
22513	22513	0.00	24.96
23034	23034	0.00	25.74

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group (R,S)-epinephrine hydrochloride
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20929-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

(R,S)-epinephrine hydrochloride; Adrenalinum racemici hydrochloridum

Special notes

When selecting the (R,S)-epinephrine hydrochloride substance/substance group, the following information is displayed to the user:

- Advice for the identification of (R,S)-epinephrine hydrochloride: According to the German BfArM, ephedrine and its salts are considered as critical pharmaceuticals in compliance to German § 5 AMG. Critical pharmaceuticals must not be placed on the market or be applied to humans.

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group (R,S)-epinephrine hydrochloride:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	(R,S)-epinephrin...	12H08-N03	20929	40	no certificate available
Fagron	(R,S)-epinephrin...	14A22-B05-291560	21567	40	no certificate available

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 80 spectra of 2 reference samples from the substance/substance group (R,S)-epinephrine hydrochloride. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group (R,S)-epinephrine hydrochloride.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	(R,S)-epinephrine hydrochlor...	14A22-B05-291560	21567 [†]	20
Fagron	(R,S)-epinephrine hydrochlor...	16H23-B98-325052	22842	40

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 (R,S)-epinephrine hydrochloride.

Supplier	Substance	Batch	Spectra
Fagron	(R,S)-epinephrine hydrochlor...	2021503	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*.

- 56 000 spectra from 335 *Apo-Ident* customers from a total of 20 610 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *(R,S)-epinephrine hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *(R,S)-epinephrine hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	60	0	81 288
Type C	0	1	0	56 000

The substance/substance group *(R,S)-epinephrine hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	100.0000 % (> 90.0000 %)
Type C	100.0000 % (> 99.8636 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20929	20929	0.00	60.86
21567	21567	0.00	62.53

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **3.4-diaminopyridine**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20317-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

3.4-diaminopyridine; 3,4-Diaminopyridinum; Amifampridinum

Special notes

When selecting the *3.4-diaminopyridine* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]

Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]

AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *3.4-diaminopyridine*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	3.4-diaminopyrid...	13F05-N01	20901	40	20130606
Inresa	3.4-diaminopyrid...	0631350001	21781	40	8899
Fagron	3.4-diaminopyrid...	16A22-B04-317264	22321	40	20160204
Inresa	3.4-diaminopyrid...	33-15-IV-56P2749B	22848	40	20160822

Validation samples

A total of 213 227 spectra were provided for validation. The results were evaluated separately according to the following sample categories:

Type A All calibration spectra.

- 160 spectra of 4 reference samples from the substance/substance group *3,4-diaminopyridine*. These samples are listed above in the [calibration samples](#) section.
- 75 718 spectra from a total of 1572 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 121 spectra of 5 reference samples from the substance/substance group *3,4-diaminopyridine*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	3,4-diaminopyridine	10J14-N21	20317	40
Fagron	3,4-diaminopyridine	10J14-N21	20526	40
Fagron	3,4-diaminopyridine	13F05-N01	20901 [†]	1
Inresa	3,4-diaminopyridine	631350001	21781 [†]	20
Fagron	3,4-diaminopyridine	16A22-B04-317264	22321 [†]	20

- 81 227 spectra from a total of 1943 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 33 spectra from 9 *Apo-Ident* customers from 19 batches from the substance/substance group *3,4-diaminopyridine*.

[†]These spectra were recorded from 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
inresa	3.4-diaminopyridine	58010001	2
Inresa	3.4-diaminopyridine	580710001	4
inresa	3.4-diaminopyridine	580710001	2
inresa	3.4-diaminopyridine	631350001	1
inresa	3.4-diaminopyridine	58710001	2
Fagron	3.4-diaminopyridine	15B20-B02	3
Inresa	3.4-diaminopyridine	33-15-IV-56P2749	2
Inresa	3.4-diaminopyridine	508670001	1
Fagron	3.4-diaminopyridine	11/14-N03	1
Caelo	3.4-diaminopyridine	13f05-n01	1
Gehe	3.4-diaminopyridine	13F07-N07	1
Fagron	3.4-diaminopyridine	11K07-N02	1
Fagron	3.4-diaminopyridine	13F07-N07	1
Fagron	3.4-diaminopyridine	13K14-M01	1
Fagron	3.4-diaminopyridine	13K14-M03	1
Fagron	3.4-diaminopyridine	13L12-M03	1
Fagron	3.4-diaminopyridine	13L12-M06	2
Fagron	3.4-diaminopyridine	14H11-B06	3
Caelo	3.4-diaminopyridine	14H11-B06-298447	2
Fagron	3.4-diaminopyridine	13K14-M02	1

- 55 968 spectra from 335 *Apo-Ident* customers from a total of 20 593 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *3.4-diaminopyridine* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *3.4-diaminopyridine* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	160	0	75 718
Type B	0	81	40	81 227
Type C	0	31	2	55 968

The substance/substance group *3.4-diaminopyridine* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 96.2500 %)
Type B	100.0000 % (> 99.9853 %)	66.9421 % (> 64.4628 %)
Type C	100.0000 % (> 99.8622 %)	93.9394 % (> 84.8485 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to

exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20901	21781	6.71	31.64
21781	21781	0.00	31.52
22321	21781	4.38	31.43
22848	21781	4.10	31.48

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **5-aminolevulinic acid hydrochloride**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20371-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

5-aminolevulinic acid hydrochloride; Acidi aminolevulinici hydrochloridum; Acidum aminolaevulinicum hydrochloricum

Special notes

When selecting the *5-aminolevulinic acid hydrochloride* substance/substance group, the following information is displayed to the user:

no information

Applicable documents

978-3-7692-5416-7 *European Pharmacopoeia 8th Edition, Basic Version 2014* [3]
Komm2.2.40 *Erfüllung von 2.2.40 Ph. Eur. durch Apo-Ident* [4]
AA004 *Erstellung und Validierung eines IdentModul-Updates*

Validation method

Validation is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *5-aminolevulinic acid hydrochloride*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	5-aminolevulinic...	11I30-N01	20371	40	AR-12-FG-007021-01
Fagron	5-aminolevulinic...	13K27-N02	21339	40	20131125

Validation samples

A total of 213 227 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 *5-aminolevulinic acid hydrochloride*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1574 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 0 spectra of 0 reference samples from the substance/substance group *5-aminolevulinic acid hydrochloride*.
- 81 348 spectra from a total of 1947 batches from further 621 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *Apo-Ident* customers carry out the measurements. *HiperScan GmbH* generally does not verify the information provided by the customer regarding manufacturer and batch number.

- 30 spectra from 16 *Apo-Ident* customers from 19 batches from the substance/substance group *5-aminolevulinic acid hydrochloride*.

Supplier	Substance	Batch	Spectra
Caelo	5-aminolevulinic acid hydroc...	13017403	1
Fagron	5-aminolevulinic acid hydroc...	13J29-N03	2
Caelo	5-aminolevulinic acid hydroc...	14145003	2
Caelo	5-aminolevulinic acid hydroc...	13K27-N02	1
Fagron	5-aminolevulinic acid hydroc...	14K04-B01-297971	2
Caelo	5-aminolevulinic acid hydroc...	14145007	1
Fagron	5-aminolevulinic acid hydroc...	11I30-N01	1
Caelo	5-aminolevulinic acid hydroc...	15254803	1
Fagron	5-aminolevulinic acid hydroc...	7447	1
Caelo	5-aminolevulinic acid hydroc...	12093205	2
Caelo	5-aminolevulinic acid hydroc...	11355616	1
Fagron	5-aminolevulinic acid hydroc...	11K09-N04	1
Caelo	5-aminolevulinic acid hydroc...	12093208	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	5-aminolevulinic acid hydroc...	12c23-n05	1
Fagron	5-aminolevulinic acid hydroc...	12H20-N01	2
Fagron	5-aminolevulinic acid hydroc...	13C19-N05	3
Fagron	5-aminolevulinic acid hydroc...	12K26-N05	2
Caelo	5-aminolevulinic acid hydroc...	13017402	1
Fagron	5-aminolevulinic acid hydroc...	13H13-N07	2
Fagron	5-aminolevulinic acid hydroc...	13K27-N02	2

- 55 971 spectra from 335 *Apo-Ident* customers from a total of 20 592 batches from a further 683 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

Validation results

The validation runs checked whether the substance/substance group *5-aminolevulinic acid hydrochloride* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *5-aminolevulinic acid hydrochloride* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to the expected result (*positive/negative*) and the validation spectrum type (*A/B/C*).

	False positive	True positive	False negative	True negative
Type A	0	80	0	75 798
Type B	0	0	0	81 348
Type C	0	26	4	55 971

The substance/substance group *5-aminolevulinic acid hydrochloride* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate* (*specificity*) and the weighted *true positive rate* (*recognition rate*) are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9853 %)	n/a (n/a)
Type C	100.0000 % (> 99.8622 %)	86.6667 % (> 76.6667 %)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra ([Rule of Three](#) [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the [Mahalanobis distance](#) to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20371	20371	0.00	80.93
21339	20371	13.01	77.35

Such samples underline the statistical spread of the original reference substance, but cannot add any new characteristics of the substance.

VALIDATION REPORT

IdentModul 1.3-2017-02

Validated substance/substance group **5-fluorouracil**
Substance class APIs & excipients, solid
Report date 12/04/2017
Report number 20959-2017-04-12
Executing company HiperScan GmbH
Weißeritzstraße 3
01067 Dresden
Germany

Relevant substance names

5-fluorouracil; 5-Fluorouracilum

Special notes

When selecting the *5-fluorouracil* substance/substance group, the following information is displayed to 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 is performed after every change to the chemometric model (also “database”) in three steps:

1. The chemometric model is calculated from the calibration spectra using a *PCA algorithm*. The calibration spectra originate from the calibration samples of all substances in this class.
2. In the *chemometric model* generated, the distances between all separable substances are checked for compliance with the specified safety distances.
3. All spectra are presented to the generated chemometric model for evaluation. In three runs, the reference spectra (*Type A*), spectra from independent samples (*Type B*), and spectra from the field (*Type C*) are presented successively. Here, no single *false positive* result is permitted.

Finally, a report is generated from the validation run results and is archived together with the parameters of the model generation in audit-compliant manner.

Calibration samples

Only spectra which have been recorded by *HiperScan GmbH* from traceable samples are used for the generation of the [chemometric models](#). The following samples have been obtained from the substance/substance group *5-fluorouracil*:

Supplier	Substance	Batch	Sample ID	Spectra	Certificate
Fagron	5-fluorouracil	13F19-N03	20959	40	1402308
Fagron	5-fluorouracil	13F19-N03	21728	40	1608169

Validation samples

A total of 213 227 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 *5-fluorouracil*. These samples are listed above in the [calibration samples](#) section.
- 75 798 spectra from a total of 1575 batches from further 383 substances. These spectra were recorded by *HiperScan GmbH*. *Type A* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type A* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix A](#). The samples in [Appendix A](#) were added for model generation not with the intention to have the model identify these substances, but with the intention to make the model reject them despite their similarity to substances identifiable.

Type B Spectra from independent samples not included in the database structure. Measurement is carried out by *HiperScan GmbH*.

These samples are allowed to originate from the same batch as calibration samples (*Type A*) as long as the package differs. In the following table spectra recorded from the same package as the corresponding calibration samples (*Type A*) are highlighted by [†].

- 60 spectra of 2 reference samples from the substance/substance group *5-fluorouracil*.

Supplier	Substance	Batch	Sample ID	Spectra
Fagron	5-fluorouracil	9D28-N12	20117	40
Fagron	5-fluorouracil	13F19-N03	21728 [†]	20

- 81 288 spectra from a total of 1945 batches from further 620 substances. These spectra were recorded by *HiperScan GmbH*. *Type B* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type B* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix B](#).

Type C Spectra of independent samples not included in the database structure. *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 *5-fluorouracil*.
- 56 001 spectra from 335 *Apo-Ident* customers from a total of 20 611 batches from a further 684 substances. These spectra were recorded by *Apo-Ident* customers. *Type C* samples are documented within this entire report. If the substance can be identified with this [chemometric model](#), the samples are listed in the *Type C* section of each substance page. If the substance cannot be identified by this model, the samples are listed in [Appendix C](#).

[†]These spectra were recorded from material of the same package as the corresponding calibration spectra (*Type A*). Hence, these spectra are not independent and are not of *Type B*.

Validation results

The validation runs checked whether the substance/substance group *5-fluorouracil* can clearly be distinguished from all other substances using NIR spectroscopy with *Apo-Ident*. For this purpose, all relevant spectra of the various substances were compared with *5-fluorouracil* and it was evaluated how many matches (positive) and rejections (negative) were correct or incorrect. The following table breaks down the numbers of correct and incorrect results according to 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	75 798
Type B	0	28	32	81 288
Type C	0	0	0	56 001

The substance/substance group *5-fluorouracil* can be clearly distinguished from all other substances. In order to make these figures comparable, the weighted *true negative rate (specificity)* and the weighted *true positive rate (recognition rate)* are determined:

	Specificity	Recognition rate
Type A	100.0000 % (> 99.9888 %)	100.0000 % (> 92.5000 %)
Type B	100.0000 % (> 99.9854 %)	46.6667 % (> 41.6667 %)
Type C	100.0000 % (> 99.8622 %)	n/a (n/a)

In order to ensure that each substance is entered with the same weight irrespective of the number of spectra available, each spectrum is weighted with the reciprocal value of its number. (If several new spectra of a substance with a very distinctive spectrum are added, the values for *specificity* and *recognition rate* are safer, but are by no means idealised.)

In order to illustrate the impact of the number of spectra, a comparison is made in parentheses as to how the *specificity* or *recognition rate* would worsen if three additional incorrect results were to exist amongst the spectra (*Rule of Three* [10, 11]). The larger the number of spectra, the lower the deterioration if the three hypothetical *incorrect results* were added.

Where the number of spectra does not exceed 20, no *recognition rate* is provided.

Identity according to identity test using NIR spectroscopy

For each substance, a certificate of the correct identity is obtained from an independent GMP-certified test laboratory. If the identity of the sample can be provided using NIR on an independently tested reference sample, in the following table the *Mahalanobis distance* to the reference sample is specified as well as the *Mahalanobis distance* to the next non-identical substance:

Sample ID	Reference sample ID	Distance to reference sample	Distance to next foreign sample
20959	20959	0.00	83.80
21728	21728	0.00	61.95

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*)

Substance (spectra also enter the generation of the [chemometric model](#) which cannot be identified with this model. This serves the purpose that substances which the model is not supposed to recognise are safely rejected. The spectra of these samples are entered into the validation as *Type A*. They were recorded by *HiperScan GmbH*.

The samples originate from 144 batches. From these, 5739 spectra were recorded. The calibration spectra of substances which can be identified with the model are listed respectively in the section *calibration samples* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra	Certificate
abcr GmbH	Dimercaptosuccin...	1005874	39	from supplier
abcr GmbH	Glycyrrhizic acid	1222024	40	from supplier
Caelo	Amphetamine sulf...	13344603	40	0814J-03361
Caelo	Amphetamine sulf...	13344603	40	0814J-03361
Caelo	Buprenorphine hy...	10242705	30	not necessary
Caelo	Buprenorphine hy...	12172908	40	0814I-07774
Caelo	Buprenorphine hy...	12172908	40	0814I-07774
Caelo	Cocaine hydrochl...	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl...	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl...	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl...	15224802	40	1316Q-01278
Caelo	Cocaine hydrochl...	13259305	40	0814J-01278
Caelo	Cocaine hydrochl...	13259305	40	0814J-01278
Caelo	Codeine phosphat...	15350703	30	1316R-01279
Caelo	Codeine phosphat...	15350703	40	1316R-01279
Caelo	Codeine phosphat...	13071504	40	0814J-01279
Caelo	Codeine phosphat...	13071504	40	0814J-01279
Caelo	Dihydrocodeine h...	12142506	40	0914B-03065
Caelo	Dihydrocodeine h...	15295901	40	1316Q-03065
Caelo	Dihydrocodeine h...	13267601	40	0914A-03065
Caelo	Dihydrocodeine h...	12142506	40	0914B-03065
Caelo	Dihydrocodeine h...	13267601	40	0914A-03065
Caelo	Dihydrocodeine h...	15295901	40	1316Q-03065
Caelo	Hydromorphone hy...	15393602	40	1516J-01334
Caelo	Hydromorphone hy...	13267702	40	0914A-01334
Caelo	Hydromorphone hy...	15393602	40	1516J-01334
Caelo	Hydromorphone hy...	13267702	40	0914A-01334
Caelo	Methadone hydroc...	12344818	40	0914E-02949
Caelo	Methadone hydroc...	15244715	40	1516A-02949
Caelo	Methadone hydroc...	15244715	40	1516A-02949
Caelo	Methadone hydroc...	12344818	40	0914E-02949
Caelo	Midazolam hydroc...	15224602	40	1516B-03538
Caelo	Midazolam hydroc...	15224602	40	1516B-03538
Caelo	Midazolam hydroc...	12215811	40	0914E-03538
Caelo	Midazolam hydroc...	12215811	40	0914E-03538
Caelo	Morphine hydroch...	15439404	40	1416R-01879
Caelo	Morphine hydroch...	13349505	40	0914F-01879
Caelo	Morphine hydroch...	13125207	40	0914E-01879
Caelo	Morphine hydroch...	13349505	40	0914F-01879
Caelo	Morphine hydroch...	13125207	40	0914E-01879
Caelo	Morphine hydroch...	15439404	40	1416R-01879
Caelo	Morphine sulfate	15255703	40	1416Q-07776
Caelo	Morphine sulfate	15255703	40	1416Q-07776
Caelo	Morphine sulfate	12153212	40	0914F-07776
Caelo	Morphine sulfate	11333103	40	0914E-07776
Caelo	Morphine sulfate	11333103	40	0914E-07776
Caelo	Oxycodone hydroc...	12268914	40	1416Q-07734
Caelo	Oxycodone hydroc...	12268913	40	1416R-07734

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Oxycodone hydroc...	12268908	40	0914E-07734
Caelo	Oxycodone hydroc...	12268908	40	0914E-07734
Caelo	Oxycodone hydroc...	12034515	40	0914F-07734
Caelo	Oxycodone hydroc...	12268913	40	1416R-07734
Caelo	Oxycodone hydroc...	12034515	40	0914F-07734
Caelo	Oxycodone hydroc...	12268914	40	1416Q-07734
Caelo	Phenobarbital	12173202	40	0914E-01040
Caelo	Phenobarbital	12173202	40	0914E-01040
Dr. Behr	L-carnitine hydr...	WE11030091	40	from supplier
Dr. Behr	L-carnitine tart...	WE11060069	40	from supplier
Dr. Behr	L-carnitine tart...	WE15080050	40	from supplier
Euro OTC	Griffonia seed e...	1205027	40	from supplier
Euro OTC	L-carnitine tart...	1302017-01	40	from supplier
Fagron	Amphetamine sulf...	15L01-B05-315291	40	1316Q-03361
Fagron	Amphetamine sulf...	13G08-N11	40	0814K-03361
Fagron	Amphetamine sulf...	15L01-B05-315291	40	1316Q-03361
Fagron	Amphetamine sulf...	13G08-N11	40	0814K-03361
Fagron	Barbital sodium	14K14-B04-303353	40	1516I-07775
Fagron	Barbital sodium	12F27-N02	40	0814I-07775
Fagron	Barbital sodium	12F27-N02	40	0814I-07775
Fagron	Barbital sodium	14K14-B04-303353	40	1516I-07775
Fagron	Cocaine hydrochl...	13I17-N02	40	0814I-01278
Fagron	Cocaine hydrochl...	13I17-N02	40	0814I-01278
Fagron	Codeine monohydr...	12C05-N05	40	0814I-01280
Fagron	Codeine monohydr...	12C05-N05	40	0814I-01280
Fagron	Codeine phosphat...	15F09-B02-310520	40	1316Q-01279
Fagron	Codeine phosphat...	13C11-N10	40	0814I-01279
Fagron	Codeine phosphat...	15F09-B02-310520	40	1316Q-01279
Fagron	Codeine phosphat...	13C11-N10	40	0814I-01279
Fagron	Dexamphetamine s...	13I23-N01	40	0814M-03582
Fagron	Dexamphetamine s...	15H06-B04-313862	40	1316Q-03582
Fagron	Dexamphetamine s...	15H06-B04-313862	40	1316Q-03582
Fagron	Dexamphetamine s...	13I23-N01	40	0814M-03582
Fagron	Dihydrocodeine h...	13H19-N03	40	0914C-03065
Fagron	Dihydrocodeine h...	13H19-N03	40	0914C-03065
Fagron	Dihydrocodeine h...	14K26-B04-306298	40	1516I-03065
Fagron	Fentanyl citrate	15F18-B01-525098	40	1316R-03686
Fagron	Fentanyl citrate	13G30-N06	40	0814M-07678
Fagron	Fentanyl citrate	13G30-N06	40	0814M-07678
Fagron	Fentanyl citrate	15F18-B01-525098	40	1316R-03686
Fagron	Fentanyl citrate	15F18-B01-525166	40	1316Q-03686
Fagron	Fentanyl citrate	15F18-B01-525166	40	1316Q-03686
Fagron	Hydromorphone hy...	13E16-N02	40	0914B-01334
Fagron	Hydromorphone hy...	13E16-N02	40	0914B-01334
Fagron	Hydromorphone hy...	13I25-N05	40	1516I-01334
Fagron	Hydromorphone hy...	13I25-N05	40	1516I-01334
Fagron	Methadone hydroc...	15E29-B02-313098	40	1516B-02949
Fagron	Methadone hydroc...	13J24-B06	40	0914F-02949
Fagron	Methadone hydroc...	15E29-B02-313098	40	1516B-02949
Fagron	Methadone hydroc...	13J24-B06	40	0914F-02949
Fagron	Midazolam	14C12-B31-313222	40	1516A-07393
Fagron	Midazolam	13K05-N01	40	0914E-07393
Fagron	Midazolam	14C12-B31-313222	40	1516A-07393
Fagron	Midazolam	13K05-N01	40	0914E-07393
Fagron	Midazolam hydroc...	13E22-N09	40	0914F-03538
Fagron	Midazolam hydroc...	13E22-N09	40	0914F-03538
Fagron	Midazolam hydroc...	14L23-B04-300245	40	1516A-03538
Fagron	Midazolam hydroc...	14L23-B04-300245	40	1516A-03538
Fagron	Morphine hydroch...	15I09-B08-312694	40	1416Q-01879
Fagron	Morphine hydroch...	13G08-N04	40	0914G-01879

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Fagron	Morphine hydroch...	13G08-N04	40	0914G-01879
Fagron	Morphine hydroch...	15I09-B08-312694	40	1416Q-01879
Fagron	Morphine sulfate	13J07-N04	40	0914G-07776
Fagron	Morphine sulfate	13J07-N04	40	0914G-07776
Fagron	Phenobarbital	15G07-B06-311718	40	1416Q-01040
Fagron	Phenobarbital	15G07-B06-311718	40	1416Q-01040
Flora Apothek...	Amygdalin	13121802	40	1405619
Flora Apothek...	Calcium colamine...	14384	40	from supplier
Flora Apothek...	Glycyrrhizic acid	11592	40	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	40	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	40	from supplier
Th. Geyer	Amphetamine sulf...	67002	40	0814I-03361
Th. Geyer	Amphetamine sulf...	67002	40	0814I-03361
Th. Geyer	Calcium colamine...	33299	40	from supplier
Th. Geyer	Cocaine hydrochl...	60145	40	0814K-01278
Th. Geyer	Cocaine hydrochl...	60145	40	0814K-01278
Th. Geyer	Codeine phosphat...	67038	40	0814K-01279
Th. Geyer	Codeine phosphat...	67038	40	0814K-01279
Th. Geyer	Dihydrocodeine h...	67035	40	0914D-03065
Th. Geyer	Dihydrocodeine h...	67035	40	0914D-03065
Th. Geyer	Methadone hydroc...	67033	40	0914G-02949
Th. Geyer	Methadone hydroc...	67047	40	0914H-02949
Th. Geyer	Methadone hydroc...	67047	40	0914H-02949
Th. Geyer	Methadone hydroc...	67033	40	0914G-02949
Th. Geyer	Mg-Ca-K colamine...	46816	40	from supplier
Th. Geyer	Mg-Ca-K colamine...	36985	40	from supplier
Th. Geyer	Morphine hydroch...	67036	40	0914H-01879
Th. Geyer	Morphine hydroch...	67036	40	0914H-01879
Th. Geyer	Phenobarbital	67045	40	0914F-01040
Th. Geyer	Phenobarbital	67045	40	0914F-01040
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	40	1316Q-07806

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 771 batches. From these 31 661 spectra were recorded. The spectra recorded on independent samples of substances which can be identified with the model are listed respectively in the section *Type B* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra	Certificate
abcr GmbH	Amygdalin	1310927	40	not necessary
abcr GmbH	Amygdalin	1310579	40	not necessary
Alfa Aesar	Theobromine, 99%	A11861	44	not available
AppliChem	Papain	1G000215	40	1407433
Audor	Dithranole	pending	49	AR-12-FG-003000-01
Aurica	Rosemary leaves,...	521306257	60	not necessary
Biogenerics	Dimercaptosuccin...	100805	40	from supplier
Bombastus	Bitter fennel	289870	60	AR-15-FG-008161-01
Bombastus	Corn silk, cut	274920	40	not necessary
Bombastus	Oak bark, cut	00254077	40	not necessary
Bombastus	Seaweed, cut	272383	40	1406341
Caelo	Agarikon	14190706	60	not necessary
Caelo	Agarikon	11024502	30	not necessary
Caelo	Agarikon	14190702	60	not necessary
Caelo	Aluminium chlori...	10026113	40	not necessary
Caelo	Aluminium oxide,...	12163019	40	not necessary
Caelo	Aluminium oxide,...	13119121	40	not necessary
Caelo	Aluminium potass...	12144605	40	from supplier
Caelo	Aluminium potass...	10079208	40	from supplier
Caelo	Ammonium chloride	10176319	40	AR-13-FG-001330-01
Caelo	Ammonium chloride	12356101	40	not necessary
Caelo	Ammonium hydroge...	81675468	40	not necessary
Caelo	Amphetamine sulf...	13344603	20	0814J-03361
Caelo	Angelica root	12080404	40	1403053
Caelo	Angelica root	12168701	40	pending
Caelo	Angelica root	12080409	40	not necessary
Caelo	Anise	11370301	40	not necessary
Caelo	Anise	11370301	40	pending
Caelo	Anise	13333903	40	not necessary
Caelo	Anise	09325104	80	F 2010 000 053
Caelo	Anise, powdered	11306203	40	not necessary
Caelo	Anise, powdered	11306208	40	not necessary
Caelo	Anise, powdered	11306204	40	AR-12-FG-007324-02
Caelo	Asparagus rhizom...	10299010	40	pending
Caelo	Asparagus rhizom...	10299012	30	pending
Caelo	Barberries	12217109	60	pending
Caelo	Barberries	11058309	40	pending
Caelo	Barberries	14057312	55	1508391
Caelo	Bentonite	pending	40	AR-14-FG-000423-01
Caelo	Bentonite	11304413	40	not necessary
Caelo	Bentonite	12237603	40	not necessary
Caelo	Bentonite	11304413	30	not necessary
Caelo	Bitter almonds	13220401	40	1406296
Caelo	Bitter fennel	13413702	40	1412549
Caelo	Bitter fennel	12094703	30	not necessary
Caelo	Bitter fennel	12167102	40	not necessary
Caelo	Bitter fennel	11185504	80	not necessary
Caelo	Bitter fennel	12094708	30	pending

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Bitter fennel	161603	60	20160718*
Caelo	Bitter fennel	14376403	60	not necessary
Caelo	Bittersweet stal...	13254305	40	not necessary
Caelo	Black cohosh rhi...	13237901	40	pending
Caelo	Black cohosh rhi...	13237903	40	not necessary
Caelo	Black cohosh rhi...	10281112	40	not necessary
Caelo	Black cohosh rhi...	10281114	40	not necessary
Caelo	Black cumin seed	11233503	40	1403495
Caelo	Black cumin seed	161157	60	not necessary
Caelo	Black cumin seed	10121916	40	not necessary
Caelo	Black mustard seed	12189303	40	1403472
Caelo	Black mustard seed	15120405	60	20150423
Caelo	Black mustard seed	11124307	40	not necessary
Caelo	Black mustard se...	12350204	80	1403711
Caelo	Black mustard se...	10064103	40	not necessary
Caelo	Black mustard se...	12009703	40	not necessary
Caelo	Black mustard se...	16051807	60	20160406
Caelo	Black mustard se...	13358304	40	pending
Caelo	Black mustard se...	12009703	40	not necessary
Caelo	Black pepper	12192311	40	1403490
Caelo	Black pepper	11193906	40	not necessary
Caelo	Black pepper	13221114	40	not necessary
Caelo	Black pepper	11193905	40	not necessary
Caelo	Blackcurrants	12272801	40	1403468
Caelo	Boldo leaves, cut	13367904	40	not necessary
Caelo	Buprenorphine hy...	12172908	20	0814I-07774
Caelo	Buprenorphine hy...	10242705	10	not necessary
Caelo	Calcium chloride...	10103114	40	not necessary
Caelo	Calcium hydrogen...	10135201	40	not necessary
Caelo	Calcium sulfate ...	10132401	40	not necessary
Caelo	Calcium sulfate ...	09246306	40	not necessary
Caelo	Cape aloe, cut	14087106	60	not necessary
Caelo	Cape aloe, cut	11048808	40	not necessary
Caelo	Cape aloe, cut	11048808	40	1404398
Caelo	Cape aloe, powde...	11132115	39	not necessary
Caelo	Cape aloe, powde...	12183008	40	not necessary
Caelo	Cape aloe, powde...	11132115	30	1404400
Caelo	Cape aloe, powde...	10237705	50	not necessary
Caelo	Cape aloe, powde...	09286307	40	not necessary
Caelo	Cape aloe, powde...	11132107	40	not necessary
Caelo	Caraway	13306006	60	AR-16-FG-000540-03
Caelo	Caraway	11003217	40	not necessary
Caelo	Caraway	09267816	50	not necessary
Caelo	Caraway	13397104	60	AR-15-FG-001527-01
Caelo	Caraway	09267815	40	AR-12-FG-007975-01
Caelo	Caraway	15097115	60	20150320
Caelo	Caraway	11003201	40	not necessary
Caelo	Caraway	13397104	40	AR-15-FG-001526-01
Caelo	Caraway	09267825	40	not necessary
Caelo	Caraway	09267814	40	not necessary
Caelo	Caraway	09334905	80	AR-12-FG-002707-01
Caelo	Caraway, crushed	16073201	60	20160414
Caelo	Caraway, crushed	12116904	40	not necessary
Caelo	Caraway, crushed	14358801	60	AR-15-FG-014914-01
Caelo	Caraway, crushed	13367101	40	not necessary
Caelo	Caraway, crushed	12116901	40	1403469
Caelo	Carbachol	11150302	40	1401147
Caelo	Cardamom fruit, ...	11247103	40	not necessary
Caelo	Cardamom fruit, ...	13026104	40	1405002
Caelo	Carob kernels, p...	13379403	40	from supplier

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Castoreum, powde...	09117503	50	pending
Caelo	Castoreum, powde...	12137409	40	1402590
Caelo	Castoreum, powde...	pending	40	pending
Caelo	Castoreum, powde...	13410403	40	not necessary
Caelo	Castoreum, powde...	13410403	40	not necessary
Caelo	Cayenne pepper, ...	12014405	40	pending
Caelo	Cayenne pepper, ...	10197606	40	AR-12-FG-008515-01
Caelo	Cayenne pepper, ...	14103104	60	not necessary
Caelo	Celery root, cut	10270002	40	not necessary
Caelo	Chickweed herb, ...	10359112	40	not necessary
Caelo	Chickweed herb, ...	13040502	40	1403482
Caelo	Chickweed herb, ...	13254411	40	1412550
Caelo	Cinchona bark, cut	11238512	40	1403463
Caelo	Cinchona bark, cut	13031007	40	not necessary
Caelo	Cinchona bark, cut	15301903	60	20151014
Caelo	Cinchona bark, cut	14009304	40	AR-15-FG-007677-01
Caelo	Cinchona bark, cut	pending	40	not necessary
Caelo	Cinnamon bark, cut	14175010	60	1505349
Caelo	Cinnamon bark, cut	16114401	60	20160511
Caelo	Cinnamon bark, cut	pending	40	not necessary
Caelo	Cinnamon bark, cut	13304414	40	not necessary
Caelo	Cinnamon bark, cut	12309902	40	pending
Caelo	Cinnamon bark, cut	11221004	40	AR-12-FG-008664-01
Caelo	Cinnamon bark, s...	13241807	40	not necessary
Caelo	Cinnamon bark, s...	11247009	40	AR-12-FG-008665-01
Caelo	Cinnamon, powder...	12242806	40	1403083
Caelo	Cinnamon, powder...	12242810	40	not necessary
Caelo	Cloves	10242010	40	AR-12-FG-008490-01
Caelo	Cloves	12095805	40	not necessary
Caelo	Cloves, powdered...	12355304	40	not necessary
Caelo	Cloves, powdered...	12355301	40	1403054
Caelo	Cocaine hydrochl...	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl...	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl...	15224802	20	1316Q-01278
Caelo	Cocaine hydrochl...	13259305	20	0814J-01278
Caelo	Cocaine hydrochl...	15224802	20	1316Q-01278
Caelo	Codeine phosphat...	15350703	20	1316R-01279
Caelo	Codeine phosphat...	13071504	20	0814J-01279
Caelo	Codeine phosphat...	11234808	40	not necessary
Caelo	Codeine phosphat...	15350703	30	1316R-01279
Caelo	Copper (II) sulf...	08258803	40	not necessary
Caelo	Coriander	11088402	40	not necessary
Caelo	Coriander	12080904	40	pending
Caelo	Coriander	13299403	40	1412548
Caelo	Coriander	11088402	40	AR-12-FG-008489-01
Caelo	Corn silk, cut	09074201	70	F 2009 001 078
Caelo	Corn silk, cut	13381501	40	not necessary
Caelo	Corn silk, cut	10325902	40	not necessary
Caelo	Corn silk, cut	10325906	40	not necessary
Caelo	Cornflower flowe...	10291110	40	pending
Caelo	Cornflower flowe...	10291105	40	pending
Caelo	Cornflower flowe...	13241902	60	AR-15-FG-005838-01
Caelo	Curcuma rhizome,...	10162302	50	not necessary
Caelo	Curcuma rhizome,...	12136503	40	1405295
Caelo	Curcuma rhizome,...	11160403	60	not necessary
Caelo	Curcuma rhizome,...	13360202	40	1411363
Caelo	Dandelion root, ...	12363102	40	1403708
Caelo	Dandelion root, ...	13329701	40	not necessary
Caelo	Dandelion root, ...	10024714	50	not necessary
Caelo	Dandelion root, ...	10024710	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Dandelion root, ...	13329708	40	1411089
Caelo	Dihydrocodeine h...	12142506	20	0914B-03065
Caelo	Dihydrocodeine h...	10223612	40	not necessary
Caelo	Dihydrocodeine h...	15295901	20	1316Q-03065
Caelo	Dihydrocodeine h...	13267601	20	0914A-03065
Caelo	Dihydrocodeine h...	15295901	20	1316Q-03065
Caelo	Dill seeds	12289901	40	1403464
Caelo	Dill seeds	12038301	40	pending
Caelo	Dill seeds	12342906	40	not necessary
Caelo	Dill seeds	12038301	40	not necessary
Caelo	Dill seeds	14018705	60	not necessary
Caelo	Dill tips, cut	11295103	40	not necessary
Caelo	Dill tips, cut	11295107	40	pending
Caelo	Dill tips, cut	13007610	40	not necessary
Caelo	Dill tips, cut	13007602	40	1402204
Caelo	Dithranole	90987209	32	I 2009 000 268
Caelo	Dittany white ro...	14110802	60	not necessary
Caelo	Dittany white ro...	10189103	40	not necessary
Caelo	Dittany white ro...	11314705	80	not necessary
Caelo	Dittany white ro...	11314705	40	pending
Caelo	Dry beads Caelo...	11005804	40	from supplier
Caelo	Dry beads Caelo...	12382203	40	from supplier
Caelo	Elderberries	13367704	40	1410179
Caelo	Elderberries	12267807	40	1403466
Caelo	Fenugreek seeds,...	11042306	40	pending
Caelo	Fenugreek seeds,...	15308704	60	20151020
Caelo	Fenugreek seeds,...	11042303	40	AR-12-FG-007209-01
Caelo	Fenugreek seeds,...	11042302	40	not necessary
Caelo	Fenugreek seeds,...	12149605	40	not necessary
Caelo	Ferric (III) sul...	10354412	40	AR-13-FG-002914-01
Caelo	Flax weed herb, ...	13007505	40	1403462
Caelo	Flax weed herb, ...	09346401	30	pending
Caelo	Flax weed herb, ...	14005309	60	not necessary
Caelo	Flaxseeds	91729389	70	F 2010 000 069
Caelo	Flaxseeds	12092102	60	not necessary
Caelo	Flaxseeds	13412801	40	not necessary
Caelo	Flaxseeds	13296703	40	not necessary
Caelo	Flaxseeds	12186902	60	not necessary
Caelo	Flohsamen	13305903	40	not necessary
Caelo	Flohsamen	10291206	40	not necessary
Caelo	Flohsamen	91730289	70	F 2009 001 077
Caelo	Flohsamen	10291205	80	not necessary
Caelo	Frankincense gra...	12120005	40	1402495
Caelo	Frankincense gra...	10349210	40	not necessary
Caelo	Frankincense gra...	10054608	40	not necessary
Caelo	Frankincense gra...	pending	40	not necessary
Caelo	Frankincense gra...	13112801	40	not necessary
Caelo	Frankincense gra...	100546	40	not necessary
Caelo	Galangal	14159504	60	1511617
Caelo	Galangal	11196506	40	pending
Caelo	Galangal	11375904	40	not necessary
Caelo	Galangal	11375909	40	1403324
Caelo	Galangal	12125001	40	not necessary
Caelo	Galangal	11048908	40	not necessary
Caelo	Galangal	12330305	40	1403491
Caelo	Galangal	12330308	40	not necessary
Caelo	Gentian root, po...	12007106	40	not necessary
Caelo	Gentian root, po...	09130203	50	not necessary
Caelo	Gentian root, po...	13410503	40	1508394
Caelo	Gentian root, po...	12007103	50	1403630

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Ginkgo dry extra...	12192505	40	1403672
Caelo	Ginkgo leaves, cut	12151703	40	1403707
Caelo	Ginkgo leaves, cut	12151703	40	not necessary
Caelo	Ginkgo leaves, cut	13340907	60	not necessary
Caelo	Ginkgo leaves, cut	13340904	40	1411088
Caelo	Ginseng root	13237805	40	not necessary
Caelo	Guaiacum wood, cut	13343802	40	not necessary
Caelo	Guaiacum wood, cut	10143017	40	not necessary
Caelo	Guaiacum wood, cut	11352001	40	1406340
Caelo	Guaiacum wood, cut	11352012	40	not necessary
Caelo	Hawthorn leaves ...	13276706	40	not necessary
Caelo	Heavy alkaline b...	11052805	40	not necessary
Caelo	Heavy, basic mag...	10290208	40	not necessary
Caelo	Henna leaves pow...	13262801	40	not necessary
Caelo	Henna leaves pow...	13298604	40	not necessary
Caelo	Hydrated sodium ...	11158903	40	not necessary
Caelo	Hydromorphone hy...	13267702	20	0914A-01334
Caelo	Hydromorphone hy...	15393602	20	1516J-01334
Caelo	Hydromorphone hy...	10157908	80	not necessary
Caelo	Hydromorphone hy...	11029713	40	not necessary
Caelo	Hydromorphone hy...	15393602	20	1516J-01334
Caelo	Iceland moss, cut	09355507	40	not necessary
Caelo	Iceland moss, cut	12187106	40	1403493
Caelo	Iceland moss, cut	13350803	40	not necessary
Caelo	Indian psyllium	11185807	40	not necessary
Caelo	Indian psyllium	11185812	40	not necessary
Caelo	Indian psyllium ...	13238005	40	not necessary
Caelo	Iodine	10237809	40	not necessary
Caelo	Iron (II) sulfat...	11340509	40	1401568
Caelo	Iron (III) chlor...	12354703	40	1401391
Caelo	Javanese curcuma...	pending	40	pending
Caelo	Javanese curcuma...	12319206	40	not necessary
Caelo	Javanese curcuma...	12185605	40	1403465
Caelo	Javanese curcuma...	13262904	40	not necessary
Caelo	Juniper berries,...	05031207	40	not necessary
Caelo	Kaolin, heavy	11350124	40	not necessary
Caelo	Kaolin, heavy	82043269	40	from supplier
Caelo	Kaolin, red, pow...	12093503	40	from supplier
Caelo	Lapacho bark, cut	11154503	40	1403811
Caelo	Lapacho bark, cut	12239305	40	not necessary
Caelo	Lavender flower	13336005	40	from supplier
Caelo	Liquorice for ad...	13262501	40	pending
Caelo	Liquorice for ad...	13180904	60	pending
Caelo	Liquorice for ad...	11267801	40	pending
Caelo	Liquorice for ad...	14050601	25	not necessary
Caelo	Mace, powdered (...)	13132201	40	not necessary
Caelo	Mace, powdered (...)	14256901	60	not necessary
Caelo	Mace, powdered (...)	14256901	60	pending
Caelo	Mace, powdered (...)	13132204	40	pending
Caelo	Magensium hydrog...	12181911	40	not necessary
Caelo	Magnesium chlori...	10043911	40	not necessary
Caelo	Magnesium chlori...	11345606	40	AR-13-FG-005982-01
Caelo	Magnesium chlori...	11032304	50	not necessary
Caelo	Magnesium chlori...	11032316	40	not necessary
Caelo	Magnesium chlori...	11218705	40	AR-12-FG-007022-01
Caelo	Magnesium sulfat...	13340814	60	not necessary
Caelo	Magnesium sulfat...	09246402	40	not necessary
Caelo	Magnesium sulfat...	11231006	40	AR-12-FG-007046-01
Caelo	Magnesium sulfat...	09377510	40	not necessary
Caelo	Manganese sulfat...	91547399	40	AR-13-FG-000299-01

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Manna, cut	13127007	40	not necessary
Caelo	Manna, cut	11308907	60	not necessary
Caelo	Manna, cut	82063319	80	F 2010 000 064
Caelo	Manna, powdered	11003608	40	not necessary
Caelo	Manna, powdered	14001401	40	not necessary
Caelo	Manna, powdered	11308807	40	1403534
Caelo	Marian thistle f...	13342002	40	from supplier
Caelo	Mate leaves, cut	13118004	40	not necessary
Caelo	Melissa leaves, ...	13214713	40	not necessary
Caelo	Methadone hydroc...	15244715	20	1516A-02949
Caelo	Methadone hydroc...	15244715	20	1516A-02949
Caelo	Methadone hydroc...	11043910	40	not necessary
Caelo	Methadone hydroc...	12344818	20	0914E-02949
Caelo	Midazolam hydroc...	15224602	20	1516B-03538
Caelo	Midazolam hydroc...	11184701	40	not necessary
Caelo	Midazolam hydroc...	12215811	20	0914E-03538
Caelo	Midazolam hydroc...	15224602	20	1516B-03538
Caelo	Milkvetch, powde...	15085602	60	not necessary
Caelo	Milkvetch, powde...	13277804	60	1507149
Caelo	Milkvetch, powde...	16110802	60	20160530
Caelo	Milkvetch, powde...	15379906	60	not necessary
Caelo	Milkvetch, powde...	09105901	30	not necessary
Caelo	Molecular distil...	11160012	40	not necessary
Caelo	Monk's pepper fr...	15318705	60	not necessary
Caelo	Monk's pepper fr...	13193401	40	AR-15-FG-006453-01
Caelo	Monk's pepper fr...	12274003	40	1501649
Caelo	Morphine hydroch...	13125207	20	0914E-01879
Caelo	Morphine hydroch...	13349505	20	0914F-01879
Caelo	Morphine hydroch...	15439404	20	1416R-01879
Caelo	Morphine hydroch...	15439404	20	1416R-01879
Caelo	Morphine sulfate	15255703	20	1416Q-07776
Caelo	Morphine sulfate	11333103	20	0914E-07776
Caelo	Morphine sulfate	15255703	20	1416Q-07776
Caelo	Morphine sulfate	12153212	60	0914F-07776
Caelo	Mustard seed, wh...	13064301	40	pending
Caelo	Mustard seed, wh...	13380501	40	not necessary
Caelo	Mustard seed, wh...	12361002	40	1403473
Caelo	Mustard seed, wh...	12349601	60	1403281
Caelo	Mustard seed, wh...	12375705	40	not necessary
Caelo	Myrrh	13108701	40	AR-15-FG-000946-01
Caelo	Myrrh	10057904	40	pending
Caelo	Myrrh	11277111	60	1403081
Caelo	Myrrh	12269901	40	1403470
Caelo	Nettle seeds	12131507	40	1402203
Caelo	Nettle seeds	11126211	40	pending
Caelo	Nettle seeds	11126212	40	not necessary
Caelo	Nettle seeds	13387110	40	1410300
Caelo	Nutmeg, powdered...	13097204	40	1403540
Caelo	Nutmeg, powdered...	10085809	50	pending
Caelo	Nystatin	11069721	40	not necessary
Caelo	Nystatin	10280622	30	not necessary
Caelo	Oak bark, cut	10348617	40	not necessary
Caelo	Oak bark, cut	13360306	40	not necessary
Caelo	Oak bark, cut	10348603	40	not necessary
Caelo	Oak bark, cut	09357416	30	not necessary
Caelo	Oak bark, cut	11351207	40	1403492
Caelo	Olive tree leaves	12316808	60	AR-15-FG-001051-01
Caelo	Olive tree leaves	11270106	40	not necessary
Caelo	Ortisophon leave...	13258805	40	not necessary
Caelo	Oxycodone hydroc...	12268913	20	1416R-07734

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Oxycodone hydroc...	12268908	20	0914E-07734
Caelo	Oxycodone hydroc...	12034515	20	0914F-07734
Caelo	Oxycodone hydroc...	12268914	20	1416Q-07734
Caelo	Oxycodone hydroc...	09190426	40	not necessary
Caelo	Oxycodone hydroc...	12268914	20	1416Q-07734
Caelo	Oxycodone hydroc...	12268913	20	1416R-07734
Caelo	Parsley seeds	11157810	40	pending
Caelo	Peppermint leave...	13288303	40	not necessary
Caelo	Phenobarbital	12173202	20	0914E-01040
Caelo	Phenobarbital	11045503	40	not necessary
Caelo	Phenol	11163809	50	not necessary
Caelo	Pine sprouts, cut	11164708	60	not necessary
Caelo	Pine sprouts, cut	13256105	40	not necessary
Caelo	Podophyllum resi...	09315906	50	not necessary
Caelo	Podophyllum resi...	12287810	40	1405242
Caelo	Potassium bromide	11208211	27	not necessary
Caelo	Potassium carbon...	09302910	40	not necessary
Caelo	Potassium dihydr...	11005709	10	not necessary
Caelo	Potassium hydroc...	10052622	50	not necessary
Caelo	Potassium hydroc...	10052616	40	AR-12-FG-002698-01
Caelo	Potassium hydrox...	10042008	40	not necessary
Caelo	Potassium monohy...	12366501	40	10401307
Caelo	Potassium monohy...	71045347	40	not necessary
Caelo	Potassium perman...	10283104	35	not necessary
Caelo	Prickly ash, cut	12074803	40	1403479
Caelo	Prickly ash, cut	12074804	40	not necessary
Caelo	Prickly ash, cut	11336405	40	not necessary
Caelo	Propolis dry ext...	11124120	40	1403460
Caelo	Propolis dry ext...	13396103	40	not necessary
Caelo	Propolis dry ext...	13396103	40	not necessary
Caelo	Pumpkin seeds, p...	12249002	40	1404542
Caelo	Pumpkin seeds, p...	12249006	40	not necessary
Caelo	Ramsons herb, cut	11182205	40	pending
Caelo	Ramsons herb, cut	12380801	40	1404538
Caelo	Redwood	12049603	40	1403471
Caelo	Redwood	12049604	40	not necessary
Caelo	Rhubarb root, cut	13235213	40	not necessary
Caelo	Rhubarb root, po...	10162405	50	not necessary
Caelo	Rhubarb root, po...	11043818	60	1403280
Caelo	Rhubarb root, po...	16009901	26	20160323
Caelo	Rifaximin	161053	60	20160607*
Caelo	Rosemary leaves,...	10139805	40	not necessary
Caelo	Rosemary leaves,...	11193408	40	not necessary
Caelo	Rosemary leaves,...	09144202	80	F 2010 000 051
Caelo	Rosemary leaves,...	14159601	60	not necessary
Caelo	Seaweed, cut	13230805	40	AR-15-FG-007678-01
Caelo	Seaweed, cut	15418801	60	20160120
Caelo	Seaweed, cut	11351105	40	pending
Caelo	Senna leaves, po...	12369908	40	1408079
Caelo	Senna leaves, po...	11193307	120	pending
Caelo	Sesame seeds	12310205	40	1403406
Caelo	Sesame seeds	12125201	40	pending
Caelo	Siam benzoin	12321314	40	not necessary
Caelo	Silver nitrate	11027007	21	not necessary
Caelo	Sodium bromide	10345710	40	AR-13-FG-002996-01
Caelo	Sodium carbonate...	10188901	40	AR-13-FG-000310-01
Caelo	Sodium dihydroge...	12198506	40	not necessary
Caelo	Sodium hydrogen ...	90962189	40	not necessary
Caelo	Sodium iodide	161701	40	20160706*
Caelo	Sodium monohydro...	08300209	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Caelo	Sodium monohydro...	12109002	40	not necessary
Caelo	Sodium monohydro...	10135302	36	not necessary
Caelo	Sodium nitrate	11045910	40	not necessary
Caelo	Sodium sulfate d...	11012210	40	not necessary
Caelo	Sodium sulfate d...	10044007	40	not necessary
Caelo	Sour cherry stal...	12042302	40	1503570
Caelo	Sour cherry stal...	10367016	40	1402576
Caelo	Star anise, cut	15329302	60	AR-16-FG-004770-01
Caelo	Star anise, cut	13041401	40	1403709
Caelo	Star anise, cut	12226301	60	pending
Caelo	Sulfamerazine	10218403	40	not necessary
Caelo	Talcum powder	11318312	120	1405338
Caelo	Talcum powder	10148813	40	not necessary
Caelo	Theriac, powdered	13407301	40	1410336
Caelo	Theriac, powdered	11082412	40	pending
Caelo	Theriac, powdered	12289307	40	1405122
Caelo	Theriac, powdered	10191904	50	not necessary
Caelo	Tormentil rhizome	12040708	40	1403487
Caelo	Tormentil rhizome	12040715	40	1403710
Caelo	Tormentil rhizome	11102003	40	pending
Caelo	Tormentil rhizome	14360103	60	1606520
Caelo	Tormentil rhizome	13220502	40	1403049
Caelo	Tormentil rhizome	10111704	50	pending
Caelo	Tormentil rhizome	12013103	40	1403048
Caelo	Tormentil rhizome	10290903	50	not necessary
Caelo	Tormentil rhizome	11102003	40	pending
Caelo	Trichloroacetic ...	81332099	20	not necessary
Caelo	Trichloroacetic ...	11294306	40	AR-12-FG-004440-01
Caelo	Valerian root, p...	12138005	40	1403809
Caelo	Valerian root, p...	13113204	60	pending
Caelo	Valerian root, p...	12138008	40	1508496
Caelo	Violet root herb...	13232103	40	not necessary
Caelo	Violet root herb...	08061209	40	not necessary
Caelo	Violet root herb...	10292002	40	pending
Caelo	Violet root herb...	13038703	40	1403481
Caelo	Walnut leaves, cut	10050402	40	not necessary
Caelo	Walnut leaves, cut	11103007	40	1403091
Caelo	Walnut leaves, cut	10050403	50	not necessary
Caelo	White pepper	12294902	40	1403488
Caelo	White pepper	12294905	40	not necessary
Caelo	White pepper	14010703	40	not necessary
Caelo	Witch hazel leav...	pending	40	not necessary
Caelo	Witch hazel leav...	10102915	40	not necessary
Caelo	Witch hazel leav...	10102915	40	not necessary
Caelo	Witch hazel leav...	13269904	40	not necessary
Caelo	Witch hazel leav...	13269902	40	1405176
Caelo	Zedoary rhizome,...	14249001	60	not necessary
Caelo	Zedoary rhizome,...	13165501	40	pending
Caelo	Zedoary rhizome,...	12344601	40	1403489
Caelo	Zinc chloride	11345504	40	not necessary
Caelo	Zinc oxide	14038101	16	not necessary
Caelo	Zinc oxide-talcu...	10192202	40	not necessary
Caelo	Zinc sulfate hep...	11095602	40	AR-13-FG-006298-01
Caelo	Zinc sulfate hep...	12257802	40	not necessary
Carotech	Tocomax 15%	100912	40	from supplier
Carotech	Tocomax 20%	A3_200003_1/5	40	not necessary
Denk	Calcium aspartate	N09814	40	not necessary
Denk	s-adenosyl methi...	S1S1104B	20	from supplier
DKSH Switzerl...	Creatine	921831	30	pending
Dr. Behr	Chlorella powder	WE11070078	40	pending

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Dr. Behr	Chromium yeast 0...	WE-11040062	40	not necessary
Dr. Behr	L-carnitine hydr...	WE11030091	20	from supplier
Dr. Behr	L-carnitine hydr...	1520081202	40	from supplier
Dr. Behr	L-carnitine tart...	WE15080050	20	from supplier
Dr. Behr	Quercetin	WE-13030084-02	40	not necessary
Dr. Behr	Red clover extra...	WE12030050-02	40	pending
Dr. Behr	Yam root dry ext...	WE12040018-01	40	not necessary
Dr. Behr	Yam root dry ext...	WE14020005-05	40	pending
El Compra	Chlorella powder	WE13010018-01	40	pending
Euro OTC	Aluminium chlori...	1106017-01	40	not necessary
Euro OTC	Aluminium chlori...	1109025-01	40	not necessary
Euro OTC	Ammonium chloride	1209013-01	40	not necessary
Euro OTC	Bentonite	2903008-01	40	from supplier
Euro OTC	Chromium yeast 0...	L1406030-02	60	not necessary
Euro OTC	Chromium yeast 0...	L1303028-01	40	1403474
Euro OTC	Copper orotate d...	2106001Z-01	40	not necessary
Euro OTC	Copper orotate d...	2106001Z-01	40	not necessary
Euro OTC	Curcuma dry extr...	L1107001	40	pending
Euro OTC	Curcuma dry extr...	L1408013	60	not necessary
Euro OTC	Curcuma dry extr...	L1107001	40	not necessary
Euro OTC	D-(+)-mannose	L1111005-02	40	not necessary
Euro OTC	D-(+)-mannose	L1111005-02	40	1405612
Euro OTC	D-(+)-mannose	L1503016-01	60	not necessary
Euro OTC	Dithranole	1203025-02	40	not necessary
Euro OTC	Heavy magnesium ...	1205012-01	40	not necessary
Euro OTC	Heavy magnesium ...	pending	27	AR-12-FG-008488-01
Euro OTC	Indian frankince...	1602008	60	20160215*
Euro OTC	Indian frankince...	1308020-01	60	8958
Euro OTC	Indian frankince...	1602008	60	20160215*
Euro OTC	Indian frankince...	1104005-01	40	pending
Euro OTC	Indian frankince...	1104005.01	40	AR-12-FG-008694-01
Euro OTC	Indian frankince...	1611023-01	60	20161215
Euro OTC	Magnesium carbon...	2910023	40	from supplier
Euro OTC	Magnesium oxide...	1109031	30	from supplier
Euro OTC	Magnesium sulfat...	1202017-01	40	not necessary
Euro OTC	Magnesium sulfat...	1109023-01	40	from supplier
Euro OTC	Magnesium trisil...	1012032-01	40	AR-13-FG-002912-01
Euro OTC	Nystatin	281103201	80	from supplier
Euro OTC	Potassium acetate	1112007	40	not necessary
Euro OTC	Potassium hydroc...	1004019-01	70	from supplier
Euro OTC	Silicium dioxide	1101027-01	40	from supplier
Euro OTC	Sodium dihydroge...	1202015-01	40	not necessary
Euro OTC	Tricalcium phosp...	1009031-01	50	from supplier
Euro OTC	Tricalcium phosp...	1206002-01	40	1402298
Euro OTC	Zinc orotate dihydro...	1203014-01	40	1407431
Euro OTC	Zinc orotate dihydro...	13050005-02	40	not necessary
Euro OTC	Zinc orotate dihydro...	1203014-01	40	not necessary
Fagron	Aluminium chlori...	12I27-N01	40	not necessary
Fagron	Aluminium potass...	12F25-N11	40	not necessary
Fagron	Aluminium potass...	10B01-N10	40	AR-12-FG-007570-01
Fagron	Amitriptyline hy...	16C31-B01-325540	40	not necessary
Fagron	Amphetamine sulf...	15L01-B05-315291	20	1316Q-03361
Fagron	Amphetamine sulf...	15L01-B05-315291	20	1316Q-03361
Fagron	Amphetamine sulf...	13G08-N11	20	0814K-03361
Fagron	Barbital sodium	12F27-N02	20	0814I-07775
Fagron	Barbital sodium	14K14-B04-303353	20	1516I-07775
Fagron	Barbital sodium	14K14-B04-303353	20	1516I-07775
Fagron	Betamethasone-17...	11F22-N03	40	AR-13-FG-002911-01
Fagron	Betamethasone-17...	11I15-N02	40	not necessary
Fagron	Betamethasone-17...	11G07IH	40	from supplier

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Fagron	Bromelain	14F20-B03295501	60	not necessary
Fagron	Bromelain	14F20-B03295501	40	pending
Fagron	Bromelain	11A10-N10	40	not necessary
Fagron	Calcium hydroxide	13E22-N07	20	not necessary
Fagron	Calcium hydroxide	10L15-N07	30	not necessary
Fagron	Chlorobutanol he...	14A06-B31-290310	60	1412458
Fagron	Clobetasol-17-pr...	13E16-N01	40	not necessary
Fagron	Cocaine hydrochl...	11G28-N11	80	not necessary
Fagron	Cocaine hydrochl...	11G15-N02	40	not necessary
Fagron	Cocaine hydrochl...	13I17-N02	20	0814I-01278
Fagron	Codeine monohydr...	12C05-N05	20	0814I-01280
Fagron	Codeine phosphat...	13C11-N10	20	0814I-01279
Fagron	Codeine phosphat...	15F09-B02-310520	20	1316Q-01279
Fagron	Codeine phosphat...	15F09-B02-310520	20	1316Q-01279
Fagron	Copper orotate d...	09F15-N01	40	pending
Fagron	Copper orotate d...	CH-565313	40	pending
Fagron	Dexamethasone 1:...	11G08-N02	40	not necessary
Fagron	Dexamphetamine s...	15H06-B04-313862	20	1316Q-03582
Fagron	Dexamphetamine s...	13I23-N01	20	0814M-03582
Fagron	Dexamphetamine s...	11F29N01	40	not necessary
Fagron	Dexamphetamine s...	15H06-B04-313862	20	1316Q-03582
Fagron	Dihydrocodeine h...	14K26-B04-306298	60	1516I-03065
Fagron	Dihydrocodeine h...	14K26-B04-306298	20	1516I-03065
Fagron	Dihydrocodeine h...	13H19-N03	20	0914C-03065
Fagron	Fentanyl citrate	13G30-N06	20	0814M-07678
Fagron	Fentanyl citrate	15F18-B01-525098	20	1316R-03686
Fagron	Fentanyl citrate	4511E-07449	80	from supplier
Fagron	Fentanyl citrate	15F18-B01-525166	20	1316Q-03686
Fagron	Fentanyl citrate	11/19-N07	40	from supplier
Fagron	Fentanyl citrate	15F18-B01-525166	20	1316Q-03686
Fagron	Fentanyl citrate	15F18-B01-525098	20	1316R-03686
Fagron	Fuchsine	11A05-N08	40	AR-12-FG-002852-01
Fagron	Heavy alkaline b...	11C10-N06	40	AR-13-FG-008124-01
Fagron	Hydromorphone hy...	13I25-N05	20	1516I-01334
Fagron	Hydromorphone hy...	13E16-N02	20	0914B-01334
Fagron	Hydromorphone hy...	13I25-N05	20	1516I-01334
Fagron	Lithium carbonate	08J06-N05	30	not necessary
Fagron	Methadone hydroc...	15E29-B02-313098	20	1516B-02949
Fagron	Methadone hydroc...	13J24-B06	20	0914F-02949
Fagron	Methadone hydroc...	15E29-B02-313098	20	1516B-02949
Fagron	Midazolam	14C12-B31-313222	20	1516A-07393
Fagron	Midazolam	14C12-B31-313222	20	1516A-07393
Fagron	Midazolam	13K05-N01	20	0914E-07393
Fagron	Midazolam hydroc...	11F20-N01	80	from supplier
Fagron	Midazolam hydroc...	14L23-B04-300245	20	1516A-03538
Fagron	Midazolam hydroc...	13E22-N09	20	0914F-03538
Fagron	Midazolam hydroc...	14L23-B04-300245	20	1516A-03538
Fagron	Morphine hydroch...	15I09-B08-312694	20	1416Q-01879
Fagron	Morphine hydroch...	15I09-B08-312694	20	1416Q-01879
Fagron	Morphine hydroch...	13G08-N04	20	0914G-01879
Fagron	Morphine sulfate	13J07-N04	20	0914G-07776
Fagron	Noscapine hydroc...	12D04-B04-284297	40	not necessary
Fagron	Phenobarbital	15G07-B06-311718	20	1416Q-01040
Fagron	Phenobarbital	15G07-B06-311718	20	1416Q-01040
Fagron	Prednisolone 1:1...	09107-N09	40	not necessary
Fagron	Prednisolone 1:1...	11L13-N06	40	AR-13-FG-000835-01
Fagron	Silver protein	10F01-N13	50	not necessary
Fagron	Silver protein a...	18000970	40	not necessary
Fagron	Sodium hydroxide...	12E02-N15	80	not necessary
Fagron	Sodium monohydro...	11E02-N14	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Fagron	Sodium monohydro...	09K02-N05	40	not necessary
Fagron	Sodium thiosulfa...	11612-N16	40	AR-13-FG-005752-01
Fagron	Thiamine nitrate	15A30-B06-309069	60	AR-16-FG-005855-01
Fagron	Thiomersal	11K01-N03	40	1401417
Fagron	Triamcinolone ac...	08K26-N05	40	from supplier
Fagron	Zinc orotate dihydro...	11K16-N10	40	not necessary
Fagron	Zinc orotate dihydro...	13J08-N05	40	not necessary
Galke	Dittany white root...	17805	40	not necessary
Galke	Nettle seeds	21186	40	pending
GoCaps	Gelatine capsules	650-004	37	AR-12-FG-010178-01
Gonmisol	Lutein 20% powder	20120320	40	not necessary
Gustav-G. Die...	Chondroitin sulf...	pending	40	AR-14-FG-001918-01
Hepart	Glucosamine sulf...	0909015	40	not necessary
Hepart	Inositol hexanic...	022901	40	not necessary
inalc	D-ribose	P19/28/069	20	not necessary
Inresa	Amitriptyline hy...	005669/17112016	40	20160429
Inresa	Sotalol hydrochl...	369-MC	40	not necessary
iphas	Cellulose capsules	53099151	37	not necessary
Kaden Biochem...	Antioxidant tea ...	0809	40	not necessary
Kaden Biochem...	Peony root dry e...	1009	40	pending
Kaden Biochem...	Peony root dry e...	1009	40	not necessary
Kaden Biochem...	Quercetin	0608	40	not necessary
Klenk	Agarikon	1061A120312	40	pending
Klenk	Ammi visnaga fruit	7120A120112	40	not necessary
Klenk	Angelica root	6085B120614	60	1509356
Klenk	Angelica root	6085B120614	40	not necessary
Klenk	Anise	2700A110701	40	not necessary
Klenk	Anise	2700A140129	60	not necessary
Klenk	Asparagus rhizom...	6151B110304	40	1403480
Klenk	Bay leaves, fine...	2124A110329	40	not necessary
Klenk	Bay leaves, fine...	2124A110329	60	not necessary
Klenk	Bay leaves, fine...	2124A110329	40	1411032
Klenk	Bitter almonds	0040A111117	40	not necessary
Klenk	Bitter fennel	2880N120418	40	1412547
Klenk	Bitter fennel	2860A140613	60	AR-15-FG-008160-01
Klenk	Bitter fennel	2880N120418	40	AR-15-FG-002805-02
Klenk	Black cumin seed	7330A110204	40	not necessary
Klenk	Black mustard seed	7430A120813	40	AR-15-FG-001050-01
Klenk	Black mustard se...	7434A120712	40	AR-15-FG-006711-01
Klenk	Buckwheat seed	7510A111011	60	pending
Klenk	Caraway	2770A110601	40	not necessary
Klenk	Caraway	2770A110601	40	pending
Klenk	Caraway	2770A110601	40	pending
Klenk	Cardamom fruit, ...	2765A130524	60	AR-15-FG-015285-01
Klenk	Celery fruit	7140A131122	60	not necessary
Klenk	Celery fruit	7140A130625	40	1405177
Klenk	Celery fruit	7140A111013	40	not necessary
Klenk	Celery root, cut	6091A110110	40	1410177
Klenk	Celery root, cut	6091N081016	40	pending
Klenk	Ceylon cinnamon,...	0614B120504	40	1403047
Klenk	Ceylon cinnamon,...	0614B120504	40	not necessary
Klenk	Cherry stalks, cut	5591A100913	40	1402575
Klenk	Cinnamon, powder...	0614B160818	60	20160822
Klenk	Cloves	1260A110608	40	not necessary
Klenk	Cloves, powdered...	1264B141007	60	AR-15-FG-014858-01
Klenk	Corn silk, cut	5581A111206	40	not necessary
Klenk	Curcuma rhizome,...	6741A110202	40	AR-12-FG-008355-01
Klenk	Dandelion root, ...	6621B151029	60	20151216
Klenk	Dandelion root, ...	6621A100510	40	not necessary
Klenk	Dill seeds	pending	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Klenk	Dill seeds	2680A110808	40	not necessary
Klenk	Elder leaves, cut	2321B130221	60	not necessary
Klenk	Elderberries	3010A120202	40	pending
Klenk	Fenugreek seeds,...	7264B130205	40	1408080
Klenk	Fenugreek seeds,...	7264A151001	60	AR-16-FG-014493-01
Klenk	Flaxseeds	7308A100705	40	not necessary
Klenk	Ginger rhizome, ...	6554B100409	40	AR-12-FG-008593-01
Klenk	Ginger rhizome, ...	6954B160429	60	20160607
Klenk	Ginger rhizome, ...	6954B140724	60	AR-15-FG-014915-01
Klenk	Ginger rhizome, ...	6954B150325	60	1606616
Klenk	Indian psyllium	7560A120330	40	1403467
Klenk	Juniper berries,...	2894B100531	40	pending
Klenk	Juniper berries,...	2894B130320	40	1411362
Klenk	Juniper berries,...	2894B150922	60	20160615
Klenk	Mace, powdered (...)	5214A090716	50	pending
Klenk	Monk's pepper fr...	7110N090701	40	pending
Klenk	Mustard seed, wh...	7254A110823	40	1403282
Klenk	Mustard seed, wh...	7254A110823	40	not necessary
Klenk	Myrrh	3355B120628	40	AR-15-FG-000945-01
Klenk	Nettle seeds	7470A111117	35	pending
Klenk	Nettle seeds	7470A110418	40	not necessary
Klenk	Nutmeg, powdered...	7325A160405	60	20160420
Klenk	Olive tree leaves	211A080311	40	AR-12-FG-008663-01
Klenk	Parsley seeds	7370A130909	40	1407600
Klenk	Parsley seeds	7370A091120	40	not necessary
Klenk	Poplar buds, cru...	3266B130826	40	1410178
Klenk	Poplar buds, cru...	3266B150624	60	not necessary
Klenk	Poplar buds, cru...	3266B101208	40	not necessary
Klenk	Rosemary leaves,...	2261A131118	60	AR-15-FG-008499-01
Klenk	Senna leaves, po...	2334B090306	50	pending
Klenk	Senna leaves, po...	2334B130606	60	AR-15-FG-015212-01
Klenk	Senna leaves, po...	2334B110207	40	pending
Klenk	Sweet fennel	2870A130304	40	1405154
Klenk	Sweet fennel	2870A110412	40	not necessary
Klenk	Theriac, powdered	13816	60	20160427
Klenk	Tormentil rhizome	6911B141114	60	AR-15-FG-014020-01
Klenk	Tormentil rhizome	6914B120112	40	not necessary
Klenk	Zedoary rhizome,...	6944B080904	50	pending
Kräuter Schulte	Angelica root	46957	40	pending
Kräuter Schulte	Angelica root	53855	40	pending
Kräuter Schulte	Anise	51600	40	not necessary
Kräuter Schulte	Black cumin seed	50371	40	not necessary
Kräuter Schulte	Caraway	53193	40	pending
Kräuter Schulte	Mustard seed, wh...	52071	40	1408078
Kräuter Schulte	Nana mint cut	44201	40	pending
Kräuter Schulte	Ox knee root, cut	42168	40	pending
Kräuter Schulte	Pu-erh tea (red ...)	52029	40	pending
Kräuter Schulte	Spring onions, c...	10445	40	pending
Kräuter Schulte	Spring onions, c...	50126	40	pending
kreatin GmbH	Creatine	300331	50	not available
Lycored corp.	Caromix	CMX-PL-101112	40	not necessary
Lycored corp.	Caromix	CMX-LLCV-011401	40	not necessary
Merck KGaA	Benzoyl peroxide...	S7012241509	60	pending
Merck KGaA	Caesium carbonate	K36017440634	40	from supplier
mikroChem	D-(+)-mannose	A-04052011/R3878	40	not necessary
MP Biomedicals	Sulfanilamide	M3567	40	1402054
Otto Fischar	Talcum powder	90841/1	40	from supplier
Pharmorgana	L-carnitine tart...	1000160672	40	not necessary
Pharmorgana	Sodium dichloroa...	1000150016	40	from supplier
Pharmorgana	Zinc orotate dihydro...	1000127154	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
Phytochem	D-ribose	pending	60	not necessary
Phytochem	D-ribose	pending	40	not necessary
Roth	Brilliant blue R...	314217301	60	from supplier
Roth	Deoxycholic acid...	385212633	60	not necessary
Roth	Deoxycholic acid...	351172090	40	not necessary
Roth	Deoxycholic acid...	084181622	40	1405618
Roth	Deoxycholic acid...	154212633	60	not necessary
Roth	Esculin	155206581	60	pending
Roth	Theobromine, 99%	145191010	60	AR-16-FG-002141-01
Roth	Theobromine, 99%	365191010	60	not necessary
Roth	Trypan blue (C.I. ...)	204209355	60	from supplier
Safic-Alcan	Amygdalin	11082101	40	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	20	from supplier
Safic-Alcan	Amygdalin, bitte...	BAE150902	20	from supplier
Safic-Alcan	Cowberry dry ext...	17320/01	40	AR-12-FG-008822-01
Sand 12 GmbH	D-ribose	L201211720	40	not necessary
sanherb	Griffonia seed e...	G-S100915	40	from supplier
Sigma-Aldrich	Bromelain	BCBM1589V	40	not necessary
Sigma-Aldrich	Bromothymol blue	MKBQ5404V	40	pending
Spinnrad	Emulsan II SP	111300063	40	from supplier
Spinnrad	Inulin	1112300433	40	not necessary
Spinnrad	Inulin	2013481819	30	not necessary
Th. Geyer	Amphetamine sulf...	67002	20	0814I-03361
Th. Geyer	Amphetamine sulf...	67002	40	not necessary
Th. Geyer	Barbital sodium	60508	40	not available
Th. Geyer	Barbital sodium	60508	80	not necessary
Th. Geyer	Calcium colamine...	260EXP1016	40	from supplier
Th. Geyer	Calcium colamine...	33299	20	from supplier
Th. Geyer	Calcium colamine...	260EXP1016	40	from supplier
Th. Geyer	Cocaine hydrochl...	60145	20	0814K-01278
Th. Geyer	Codeine phosphat...	67038	20	0814K-01279
Th. Geyer	Dihydrocodeine h...	67035	20	0914D-03065
Th. Geyer	Methadone hydroc...	67033	20	0914G-02949
Th. Geyer	Methadone hydroc...	67047	20	0914H-02949
Th. Geyer	Mg-Ca-K colamine...	36985	20	from supplier
Th. Geyer	Mg-Ca-K colamine...	117EXP1016	40	from supplier
Th. Geyer	Mg-Ca-K colamine...	117EXP1016	40	from supplier
Th. Geyer	Morphine hydroch...	67036	20	0914H-01879
Th. Geyer	Morphine hydroch...	56311	40	not necessary
Th. Geyer	Phenobarbital	67045	20	0914F-01040
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	60	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	60	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	60	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	60	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
THC-Pharma GmbH	Cannabidiol	15-7221-80338	20	1316Q-07806
Vitatene	Betanat® 10% CWD	400101E10	40	not necessary
Vitaworld	D-(+)-mannose	5449324	40	not necessary
VMP Chemiekon...	D-(+)-glucosamin...	144212943	40	20140402
Wellmune	1.25-beta-glucan	10176-021	40	not necessary
pending	Bromothymol blue	pending	40	not necessary
pending	Kaolin, heavy	pending	50	not necessary
pending	Magnesium sulfat...	pending	40	not necessary
pending	Milkvetch, powde...	pending	40	not necessary
pending	Naloxone hydroch...	pending	40	not necessary
pending	Potassium monohy...	pending	40	not necessary

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra	Certificate
pending	Sodium butyrate	pending	40	not necessary
pending	Sodium propionate	pending	40	not necessary
pending	Sodium thiosulfa...	pending	40	AR-13-FG-001882-01

*The spectra were taken from a part of the same sample which the supplier used for its analysis (identity, purity, content). In this case the manufacturer certificates proof the identity and quality of the sample from those the spectra descend.

Appendix C: Additional validation samples (*Type C*)

Spectra for substances from the field which cannot be identified with this model also enter the validation. In this manner, it is verified that the model also rejects unknown substances. The spectra for these samples were recorded by *Apo-Ident* customers. They belong to *Type C*. The information provided by the customer regarding the manufacturer and batch number is taken over by *HiperScan GmbH* to a large extent unchecked.

The samples originate from 7663 batches. From these, 18 426 spectra were recorded. The spectra recorded on independent samples of substances from the field which can be identified with the model are listed respectively in the section *Type C* for the individual substances and do not appear again elsewhere in this list.

Supplier	Substance	Batch	Spectra
A.H. 27.05.13 ek: 6,75EUR	Speedwell wort, cut	274239	1
AHD	Milkvetch, powdered	15379906	2
AHD	Sodium hydrogen carbo...	1208008-01	11
AHD	Sodium monohydrogenph...	112345013	1
Akazie	Black cumin seed	20.09.2015	1
Akazie	Cinnamon bark, cut	20.09.2015	1
Akazie	Dill seeds	20.09.2015	1
Akazie	Flaxseeds	20.09.2015	2
Akazie	Rosemary leaves, cut	20.09.2015	1
Akazien-Apo	Cinnamon bark, cut	Test	1
Aldrich	Sodium proprionate	U02796-056	1
Alfred Galke	Bitter fennel	18270	1
Alfred Galke	Caraway	20069	1
Alfred Galke	Lady's mantle herb, cut	20921	1
Alfred Galke	Melissa leaves, cut	D-NI-1-9516-BC	1
Alfred Galke	Raspberry leaves, cut	19851	1
Alfred Galke	Shepherd's purse herb...	20591	1
Alfred Galke	Yarrow herb, cut	19861	1
Alliance	Erica herb, cut	255389	1
Alliance	Hawthorn flower	13010403	1
Alliance	Herb Robert, cut	3951A110621	5
Alliance	Sodium monohydrogenph...	12256606	1
Alliance Health	Aluminium potassium s...	13025401	3
Alliance healthcare	Sodium monohydrogenph...	12L05-N04	2
Alliance Healthcare	Aluminium potassium s...	13025404	1
an	Blessed thistle herb,...	13389704	1
an	Gentian root, cut	6311b130305	1
an	Hawthorn leaves with ...	1971A130930	2
an	Hibiscus flower	14018101	1
an	Passionflower herb, cut	13141212	1
an	Raspberry leaves, cut	13086708	1
an	Vervain herb, cut	12383007	1
Anzag	Aluminium chloride he...	1109025-01	6
Anzag	Aluminium potassium s...	1218441	1
Anzag	Angelica root	12168703	3
Anzag	Blessed thistle herb,...	271946	1
Anzag	Calamus rhizome, unpe...	276260	3
Anzag	Common centaury, cut	2727897	1
Anzag	Corn silk, cut	274920	1
Anzag	Cowberry dry extract ...	20206/01	1
Anzag	Dandelion herb with r...	274030	1
Anzag	Deadnettle herb with ...	11010606	1
Anzag	Flaxseeds	12137105	1
Anzag	Herb Robert, cut	11147806	1
Anzag	Indian psyllium	11185818	1
Anzag	Lavender flower	1488A12803	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Anzag	Lime flower, cut	7120	1
Anzag	Magnesium chloride he...	111201301	1
Anzag	Magnesium chloride he...	1304003-01	2
Anzag	Magnesium chloride he...	120802501	1
Anzag	Marian thistle fruit	11126702	12
Anzag	Marigold flower, cut	12221706	16
Anzag	Marshmallow root, pee...	11126702	1
Anzag	Meadowsweet herb, cut	10381602	5
Anzag	Mullein flower, cut	11020714	3
Anzag	Nystatin	2902041-02	1
Anzag	Passionflower herb, cut	1207211669	1
Anzag	Ramsons herb, cut	11182207	2
Anzag	Star anise	10376403	5
Anzag	Trichloroacetic acid	12135204	5
Anzag	Turnera diffusa herb,...	11026606	1
Anzag	Woodruff herb, cut	12103504	2
Anzag	Yarrow herb, cut	11306307	1
ANZAG	Walnut leaves, cut	12124603	16
Anzag 05.10.2012	Coltsfoot leaves, cut	121005	2
Anzag 06.04.2016	Anise	15398601	1
Anzag 07.11.12	Liquorice root, peeled	11034018	1
Anzag 07.11.12 ek: 2,48	Aluminium potassium s...	12184402	5
Anzag 10.05.2010	Hawthorn leaves with ...	1910E-01485	1
Anzag 10.05.13 ek:3,16EUR	Dandelion herb with r...	6611B130321	1
Anzag 11.09.2012	Calcium hydroxide	112F08-N02	1
Anzag 12.03.13 ek: 4,...	St. John's wort, cut	11185608	2
Anzag 12.11.12 ek:11,04	Lime flower, cut	1611B120827	14
Anzag 12.11.12 ek:3,85	Yarrow herb, cut	11280513	1
Anzag 13.02.13 ek: 4,...	Magnesium sulfate, dr...	11265910	1
Anzag 13.03.13 ek: 6,...	Lady's mantle herb, cut	12153309	18
Anzag 13.12.12 ek: 5,...	Marigold flower, cut	1241C120321	5
Anzag 17.04.13 ek: 2,...	Golden rot wort, cut	4521A110816	2
Anzag 17.07.2012	Dithranole	APDT/365/2011D	3
Anzag 19.09.2012	Mustard seed, white, ...	11114409	2
Anzag 22.03.13 ek: 5,...	Cape aloe, powdered	12232102	1
Anzag 25.10.12 ek:3,16EUR	Dandelion herb with r...	6611B110131	1
Anzag 26.02.13 ek: 10,...	Willowherb, small-flo...	4721C120321	17
Anzag 26.10.12 2.36EUR	Oak bark, cut	10348616	6
Anzag 27.12.12 ek:2,79	Blackberry leaves, cut	10136048	1
Anzag 28.08.2012	Bilberry fruit, dried	10273712	1
Anzag 28.08.2012	Daisies	11068306	1
Anzag 28.08.2012	Dandelion root, cut	11003311	3
Anzag 29.04.13 ek: 4,...	Magnesium sulfate hep...	12138518	4
Anzag 6.03.13 ek: 13,...	Matricaria flower	12244805	4
anzag 8.8.13	Nettle leaves, cut	12183901	3
Anzag am 05.05.2012	Marshmallow root, pee...	11101809	1
ANZAG am 06.06.2012	Rosemary leaves, cut	268132	4
Anzag am 08.05.2012	Aluminium chloride he...	12C07-N01	15
Anzag am 08.05.2012	Motherwort herb, cut	10244612	1
ANZAG am 15.05.2012	Aluminium potassium s...	1108049-01	4
ANZAG am 15.05.2012	Genuine cleaver's her...	10375704	1
ANZAG am 22.05.2012	Aluminium potassium s...	12022401	2
ANZAG am 22.05.2012	Raspberry leaves, cut	2291A111124	3
ANZAG am 23.05.2012	Calcium hydrogen phos...	10135228	2
ANZAG am 23.05.2012	Mugwort herb, cut	11286301	1
ANZAG am 23.05.2012	Potassium hydrocarbon...	11105811	4
ANZAG am 23.05.2012	Rosemary leaves, cut	2261A100916	1
Anzag am 24.04.2012	Fumitory herb, cut	3881B100127	3
Anzag am 24.05.2012	Sodium hydrogen carbo...	11E31-N04	1
Anzag ek: 2,59EUR 19.09...	Caraway	11003216	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Anzag ek: 4,58EUR 25.09....	Walnut leaves, cut	2111A120123	9
Anzag ek: 4,88EUR 26.09....	Speedwell wort, cut	4661C120321	10
Anzag ek: 6,39 11.09....	Lady's mantle herb, cut	11182806	8
Anzag ek:2,64EUR 16.07.12	Mistletoe herb, cut	10273417	1
Anzag ek:3,13EUR 15.09.12	Melilot herb, cut	11307605	5
Anzag ek:8.77EUR 30.08.12	Manna, cut	11308904	5
Anzag EK7,91 08.08.12	Gentian root, cut	10263407	1
Anzag, 18.07.2012	Yarrow herb, cut	11106405	1
Anzag, 24.10.2012	Yarrow herb, cut	270116	2
anzag, 31.10.2012	Lavender flower		1
anzag,26.11.12	Ammonium hydrogen car...	12022308	5
Anzag/	Calamus rhizome, peeled	6701B120817	5
Anzag/	Dithranole	APDT3652011	1
Anzag/	Herb Robert, cut	11147813	5
Apomix / 11	Carbachol	12330703	1
apomix/Phönix	Oak bark, cut	9357419	2
Apotheke Bühlau	Bitter almonds	267467	2
Apotheke Bühlau	Horse chestnut leaves...	100416	1
Audor Pharma	Dithranole	APDT3902013D	1
Audor Pharma	Dithranole	DT/351/2010D	1
Audor Pharma	Dithranole	APDT/351/2010D	1
Audor Pharma	Dithranole	APDT/365/2011	4
Audor Pharma	Dithranole	APDT/365/2011/	1
Audor Pharma	Dithranole	DT/365/2011D	1
Audor Pharma	Dithranole	APDT3752012D	3
Audor Pharma	Dithranole	ApDt/365/2011D	1
Audor Pharma	Nystatin	AP11G07-N12N	1
Audor Pharma	Nystatin	11C07-N05N	1
Audor Pharma	Nystatin	AP11K11-N04N	1
Aurica	Birch leaves, cut	521205644	1
Aurica	Dandelion herb with r...	521200197	1
Aurica	Golden rot wort, cut	521201267	1
Aurica	Golden rot wort, cut	224133	2
Aurica	Horsetail herbs, cut	521205308	1
Aurica	Passionflower herb, cut	521300655	1
Aurica	Red clover flower	521203442	1
Aurica	Sage leaves, cut	521204613	1
Aurica	St. John's wort, cut	521202559	1
Aurica	Thyme, rubbed	521207003	1
Aurica	Valerian root, cut	221838	1
Aurica / 11	Horsetail herbs, cut	521302898	1
Aurica / 11	Juniper berries	521301390	1
Aurica / 11	Primrose flower	521301234	1
Aurica Naturheilmitte...	Anise, powdered	521405796	1
Aurica Naturheilmitte...	Anise	521600679	1
Aurica/ Noweda	St. John's wort, cut	521305424	1
Aurica/ Vedono	Peppermint leaves, cut	521301217	1
Aurica/Anzag	Red clover flower	521303918	1
Aurica/Gehe	Primrose flower	521203308	1
Aurica/Phönix	Angelica root	520800638	1
Aurica/Phönix	Bean-pods, cut	5052301	1
Aurica/Phönix	Calamus rhizome, peeled	150649	1
Aurica/Phönix	Common centaury, cut	520702152	1
Aurica/Phönix	Corn silk, cut	520901387	1
Aurica/Phönix	Mistletoe herb, cut	6110801	1
Aurica/Phönix	Speedwell wort, cut	520708362	1
Bahnhof-Apotheke	Anise	7-120913	1
Bahnhof-Apotheke	Birch leaves, cut	18-120702	1
Bahnhof-Apotheke	Bitter fennel	11-121029	1
Bahnhof-Apotheke	Blackberry leaves, cut	18-120702	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bahnhof-Apotheke	Caraway	18-120709	1
Bahnhof-Apotheke	Clubmoss herb, cut	17-121112	1
Bahnhof-Apotheke	Corn silk, cut	20-121018	1
Bahnhof-Apotheke	Elder flower, rubbed	17-121112	1
Bahnhof-Apotheke	Flohsamen	3-121005	1
Bahnhof-Apotheke	Hawthorn leaves with ...	7-121011	1
Bahnhof-Apotheke	Hay flowers	13-121105	1
Bahnhof-Apotheke	Lady's mantle herb, cut	17-121107	1
Bahnhof-Apotheke	Lime flower, cut	7-121011	1
Bahnhof-Apotheke	Liquorice root, peeled	17-121112	1
Bahnhof-Apotheke	Marigold flower, cut	17-121106	1
Bahnhof-Apotheke	Matricaria flower	11-121024	1
Bahnhof-Apotheke	Melissa leaves, cut	17-120917	1
Bahnhof-Apotheke	Nettle leaves, cut	7-121109	1
Bahnhof-Apotheke	Oak bark, cut	17-121106	1
Bahnhof-Apotheke	Plantain leaves, cut	7-121011	1
Bahnhof-Apotheke	Raspberry leaves, cut	17-120917	1
Bahnhof-Apotheke	Rosemary leaves, cut	7-120915	1
Bahnhof-Apotheke	Sage leaves, cut	3-121018	1
Bahnhof-Apotheke	Shepherd's purse herb...	4-120924	1
Bahnhof-Apotheke	Speedwell wort, cut	4-121002	1
Bahnhof-Apotheke	St. John's wort, cut	4-121018	1
Bahnhof-Apotheke	Thyme, rubbed	17-121112	1
Bahnhof-Apotheke	Willowherb, small-flo...	17-121107	1
Bahnhof-Apotheke	Wormwood herb, cut	17-121107	1
Bahnhof-Apotheke	Yarrow herb, cut	7-121011	1
Berkel AHK	Anise	14194401	1
Berkel AHK	Anise	13333902	9
Berkel AHK	Anise	13333907	11
Berkel AHK	Anise	13333912	3
Berkel AHK	Anise	11374103	2
Berkel AHK	Anise	14110202	1
Berkel AHK	Caraway	13397103	2
Berkel AHK	Monk's pepper fruit	14194401	1
Berkel AHK	Oak bark, cut	13360310	1
Berkel AHK	Oak bark, cut	13011905	1
Berkel AHK	Oak bark, cut	13360303	5
Berkel AHK	Valerian root, powdered	19196802	1
Berkel AHK	Valerian root, powdered	14179403	2
Berkel AHK	Valerian root, powdered	13287406	1
BimSiframGroup	Amygdalin	141120	1
BimSiframGroup	Amygdalin	13121802	2
BimSiframGroup	Amygdalin	STA130512002	2
Biogenerics	Amygdalin	NSIH03040	1
BLS	Phenobarbital	67056	1
bohn	Walnut shells, cut	11325606	1
Bomba/AHD	Coltsfoot leaves, cut	276303	6
Bomba/AHD	Golden rot wort, cut	279526	1
Bomba/AHD	Horsetail herbs, cut	280449	4
Bomba/AHD	Willow bark, cut	280362	1
Bombastus	Alpine lady's mantle ...	278889	1
Bombastus	Angelica root	278294	1
Bombastus	Angelica root	281280	7
Bombastus	Angelica root	283387	1
Bombastus	Angelica root	285732	2
Bombastus	Angelica root	275878	1
Bombastus	Angelica root	290309	1
Bombastus	Angelica root	218280	1
Bombastus	Angelica root	270117	2
Bombastus	Angelica root	275879	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Angelica root	272954	4
Bombastus	Angelica root	272895	1
Bombastus	Angelica root	277310	4
Bombastus	Angelica root	284545	1
Bombastus	Anise	282917	1
Bombastus	Anise	285778	2
Bombastus	Anise	278925	2
Bombastus	Anise	276456	1
Bombastus	Anise	285777	1
Bombastus	Anise	273682	1
Bombastus	Anise	268180	1
Bombastus	Arnica flower	280672	1
Bombastus	Arnica flower	271581	1
Bombastus	Arnica flower	271668	1
Bombastus	Artichoke leaves, cut	8202213593	1
Bombastus	Bean-pods, cut	278686	1
Bombastus	Bean-pods, cut	278696	3
Bombastus	Bean-pods, cut	282475	1
Bombastus	Bean-pods, cut	270517	2
Bombastus	Bean-pods, cut	240503	1
Bombastus	Bean-pods, cut	272781	5
Bombastus	Bearberry leaves, cut	275491	3
Bombastus	Bearberry leaves, cut	272297	8
Bombastus	Bilberry leaves, cut	283170	1
Bombastus	Bilberry leaves, cut	273581	2
Bombastus	Bilberry leaves, cut	272176	3
Bombastus	Birch leaves, cut	274499	2
Bombastus	Birch leaves, cut	274498	1
Bombastus	Birch leaves, cut	272385	1
Bombastus	Birch leaves, cut	270743	1
Bombastus	Birch leaves, cut	266623	2
Bombastus	Birch leaves, cut	278316	1
Bombastus	Birch leaves, cut	269195	1
Bombastus	Birch leaves, cut	277822	2
Bombastus	Birch leaves, cut	267077	2
Bombastus	Bitter almonds	275600	1
Bombastus	Bitter almonds	275001	2
Bombastus	Bitter almonds	275601	1
Bombastus	Bitter almonds	267529	1
Bombastus	Bitter almonds	303218	2
Bombastus	Bitter almonds	290973	4
Bombastus	Bitter almonds	284978	1
Bombastus	Bitter almonds	305322	1
Bombastus	Bitter fennel	275921	1
Bombastus	Bitter fennel	275922	5
Bombastus	Bitter fennel	289870	1
Bombastus	Bitter fennel	273706	5
Bombastus	Bitter fennel	289870	2
Bombastus	Bitter fennel	289869	1
Bombastus	Bitter fennel	267683	1
Bombastus	Bitter fennel	268130	4
Bombastus	Bitter fennel	280891	2
Bombastus	Bitter fennel	296877	1
Bombastus	Bitter fennel	293627	1
Bombastus	Bitter fennel	285609	1
Bombastus	Bitter orange peel, cut	267364	1
Bombastus	Blackberry leaves, cut	261490	1
Bombastus	Blackberry leaves, cut	273668	3
Bombastus	Blackberry leaves, cut	267122	3
Bombastus	Calamus rhizome, peeled	269479	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Calamus rhizome, peeled	274159	1
Bombastus	Calamus rhizome, unpe...	224114	1
Bombastus	Calamus rhizome, unpe...	273214	1
Bombastus	Calamus rhizome, unpe...	282476	1
Bombastus	Calamus rhizome, unpe...	281692	1
Bombastus	Calamus rhizome, unpe...	277958	1
Bombastus	Caraway	275849	2
Bombastus	Caraway	270124	1
Bombastus	Caraway	270278	1
Bombastus	Caraway	272730	1
Bombastus	Caraway	275228	1
Bombastus	Caraway	277491	2
Bombastus	Coltsfoot leaves, cut	269501	5
Bombastus	Coltsfoot leaves, cut	277131	1
Bombastus	Coltsfoot leaves, cut	26693	1
Bombastus	Coltsfoot leaves, cut	232339	1
Bombastus	Coltsfoot leaves, cut	277848	2
Bombastus	Coltsfoot leaves, cut	265856	1
Bombastus	Coltsfoot leaves, cut	285263	3
Bombastus	Coltsfoot leaves, cut	281100	4
Bombastus	Coltsfoot leaves, cut	266691	2
Bombastus	Coltsfoot leaves, cut	272019	1
Bombastus	Coltsfoot leaves, cut	275489	3
Bombastus	Coltsfoot leaves, cut	274289	5
Bombastus	Coltsfoot leaves, cut	278758	7
Bombastus	Comfrey herb, cut	281531	1
Bombastus	Common centaury, cut	262982	2
Bombastus	Common centaury, cut	277598	3
Bombastus	Common centaury, cut	281951	1
Bombastus	Coriander	263733	1
Bombastus	Corn silk, cut	271033	1
Bombastus	Corn silk, cut	276776	1
Bombastus	Corn silk, cut	285912	1
Bombastus	Corn silk, cut	282574	3
Bombastus	Cornflower flower wit...	275759	2
Bombastus	Couchgrass root rhizo...	269196	1
Bombastus	Couchgrass root rhizo...	270500	2
Bombastus	Couchgrass root rhizo...	273387	4
Bombastus	Couchgrass root rhizo...	276777	4
Bombastus	Couchgrass root rhizo...	262175	1
Bombastus	Dandelion herb with r...	274030	4
Bombastus	Dandelion herb with r...	280363	6
Bombastus	Dandelion herb with r...	264967	1
Bombastus	Dandelion herb with r...	277597	8
Bombastus	Dandelion herb with r...	280363-3385310110	1
Bombastus	Dandelion herb with r...	282916	6
Bombastus	Dandelion herb with r...	271272	5
Bombastus	Dandelion herb with r...	285264	1
Bombastus	Dandelion herb with r...	290125	1
Bombastus	Dandelion herb with r...	275126	3
Bombastus	Dandelion herb withou...	11371901	1
Bombastus	Dandelion herb withou...	11371906	2
Bombastus	Dill tips, cut	50836505	1
Bombastus	Elder flower, rubbed	269873	3
Bombastus	Elder flower, rubbed	265631	1
Bombastus	Elder flower, rubbed	279216	9
Bombastus	Elder flower, rubbed	275393	5
Bombastus	Erica herb, cut	278314	2
Bombastus	Eyebright herb, cut	274553	1
Bombastus	Eyebright herb, cut	278108	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Eyebright herb, cut	277846	1
Bombastus	Flaxseeds	269500	1
Bombastus	Flaxseeds	278457	6
Bombastus	Flaxseeds	274032	1
Bombastus	Flaxseeds	295376	1
Bombastus	Flaxseeds	282734	3
Bombastus	Flaxseeds	1610	1
Bombastus	Frangula bark, cut	278599	4
Bombastus	Frangula bark, cut	249091	2
Bombastus	Frangula bark, cut	268407	4
Bombastus	Frangula bark, cut	238812	1
Bombastus	Frangula bark, cut	270733	1
Bombastus	Frangula bark, cut	275998	4
Bombastus	Frangula bark, cut	281284	1
Bombastus	Frangula bark, cut	273926	1
Bombastus	Genuine cleaver's her...	3921B120130	1
Bombastus	Golden rot wort, cut	278697	5
Bombastus	Golden rot wort, cut	269563	2
Bombastus	Golden rot wort, cut	274290	4
Bombastus	Golden rot wort, cut	271460	1
Bombastus	Golden rot wort, cut	270047	5
Bombastus	Golden rot wort, cut	271459	1
Bombastus	Golden rot wort, cut	261756	1
Bombastus	Golden rot wort, cut	209974	1
Bombastus	Hawthorn leaves with ...	273287	1
Bombastus	Hawthorn leaves with ...	272177	1
Bombastus	Hawthorn leaves with ...	275309	3
Bombastus	Hawthorn leaves with ...	282220	1
Bombastus	Hawthorn leaves with ...	272881	1
Bombastus	Hawthorn leaves with ...	264044	1
Bombastus	Hawthorn leaves with ...	265197	2
Bombastus	Hawthorn leaves with ...	275310	1
Bombastus	Hawthorn leaves with ...	278756	1
Bombastus	Hawthorn leaves with ...	267551	2
Bombastus	Hawthorn leaves with ...	267000	1
Bombastus	Hawthorn leaves with ...	267551	1
Bombastus	Hop strobile	277821	2
Bombastus	Hop strobile	276976	1
Bombastus	Hop strobile	10240403	1
Bombastus	Hop strobile	271870	2
Bombastus	Hop strobile	208502	1
Bombastus	Horsetail herbs, cut	6011401	1
Bombastus	Horsetail herbs, cut	265924	1
Bombastus	Horsetail herbs, cut	264101	1
Bombastus	Horsetail herbs, cut	264100	1
Bombastus	Horsetail herbs, cut	273963	2
Bombastus	Horsetail herbs, cut	274714	1
Bombastus	Horsetail herbs, cut	275836	2
Bombastus	Horsetail herbs, cut	275891	3
Bombastus	Horsetail herbs, cut	279133	2
Bombastus	Horsetail herbs, cut	280647	1
Bombastus	Horsetail herbs, cut	268534	1
Bombastus	Horsetail herbs, cut	274168	1
Bombastus	Horsetail herbs, cut	269031	2
Bombastus	Horsetail herbs, cut	272552	3
Bombastus	Iceland moss, cut	12187108	3
Bombastus	Javanese curcuma root...	262792	1
Bombastus	Javanese curcuma root...	284242	2
Bombastus	Javanese curcuma root...	282221	2
Bombastus	Lady's mantle herb, cut	264972	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Lady's mantle herb, cut	14066007	1
Bombastus	Lady's mantle herb, cut	272021	5
Bombastus	Lady's mantle herb, cut	276173	4
Bombastus	Lady's mantle herb, cut	268287	1
Bombastus	Lady's mantle herb, cut	263194	1
Bombastus	Lady's mantle herb, cut	521203995	1
Bombastus	Lady's mantle herb, cut	282032	2
Bombastus	Lady's mantle herb, cut	279070	6
Bombastus	Lady's mantle herb, cut	278889	3
Bombastus	Lavender flower	268831	2
Bombastus	Lavender flower	274469	1
Bombastus	Lavender flower	276799	2
Bombastus	Lime flower, cut	276813	1
Bombastus	Lime flower, cut	268477	2
Bombastus	Lime flower, cut	281042	1
Bombastus	Lime flower, cut	266863	1
Bombastus	Lime flower, cut	267693	1
Bombastus	Lime flower, cut	280678	3
Bombastus	Lime flower, cut	275129	3
Bombastus	Lime flower, cut	25091205	1
Bombastus	Liquorice root, peeled	268001	1
Bombastus	Liquorice root, peeled	270853	4
Bombastus	Liquorice root, unpee...	903312151	1
Bombastus	Liquorice root, unpee...	5091305	1
Bombastus	Liquorice root, unpee...	267852	2
Bombastus	Liquorice root, unpee...	3713Q2151	1
Bombastus	Liquorice root, unpee...	2901312151	1
Bombastus	Liquorice root, unpee...	286584	1
Bombastus	Liquorice root, unpee...	285185	2
Bombastus	Liquorice root, unpee...	284243	2
Bombastus	Liquorice root, unpee...	274921	3
Bombastus	Liquorice root, unpee...	279409	2
Bombastus	Liquorice root, unpee...	276468	4
Bombastus	Liquorice root, unpee...	278377	4
Bombastus	Lovage root, cut	260409	1
Bombastus	Magnesium sulfate hep...	277424	1
Bombastus	Mallow leaves, cut	272034	2
Bombastus	Mallow leaves, cut	273803	1
Bombastus	Mallow leaves, cut	278925	2
Bombastus	Mallow leaves, cut	267168	3
Bombastus	Marian thistle fruit	269499	1
Bombastus	Marian thistle fruit	299483	1
Bombastus	Marian thistle fruit	296535	1
Bombastus	Marian thistle fruit	272575	1
Bombastus	Marian thistle fruit	262426	1
Bombastus	Marian thistle fruit	296193	1
Bombastus	Marian thistle fruit	284420	1
Bombastus	Marian thistle fruit	277720	3
Bombastus	Marian thistle fruit	278378	1
Bombastus	Marian thistle fruit	282034	2
Bombastus	Marian thistle fruit	278379	1
Bombastus	Marian thistle fruit	7180A110209	4
Bombastus	Marian thistle fruit	279405	3
Bombastus	Marian thistle fruit	268192	1
Bombastus	Marigold flower witho...	279632	1
Bombastus	Marigold flower witho...	268626	1
Bombastus	Marigold flower witho...	280306	2
Bombastus	Marigold flower, cut	253620	1
Bombastus	Marigold flower, cut	234997	1
Bombastus	Marigold flower, cut	275128	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Marigold flower, cut	207294	1
Bombastus	Marigold flower, cut	275813	1
Bombastus	Marigold flower, cut	279632	1
Bombastus	Marigold flower, cut	261332	1
Bombastus	Marigold flower, cut	270046	5
Bombastus	Marshmallow root, unp...	272130	2
Bombastus	Marshmallow root, unp...	270467	1
Bombastus	Matricaria flower	277959	6
Bombastus	Matricaria flower	278414	2
Bombastus	Matricaria flower	277997	2
Bombastus	Matricaria flower	280143	2
Bombastus	Matricaria flower	264997	1
Bombastus	Matricaria flower	276307	1
Bombastus	Matricaria flower	273388	3
Bombastus	Matricaria flower	270579	4
Bombastus	Matricaria flower	262364	2
Bombastus	Matricaria flower	268712	1
Bombastus	Matricaria flower	266864	1
Bombastus	Matricaria flower	268408	3
Bombastus	Matricaria flower	283710	2
Bombastus	Matricaria flower	274870	2
Bombastus	Matricaria flower	273667	2
Bombastus	Matricaria flower	274105	1
Bombastus	Matricaria flower	274106	3
Bombastus	Matricaria flower	271781	5
Bombastus	Melissa leaves, cut	270044	2
Bombastus	Melissa leaves, cut	277722	2
Bombastus	Melissa leaves, cut	266341	1
Bombastus	Melissa leaves, cut	276579	1
Bombastus	Melissa leaves, cut	271499	3
Bombastus	Melissa leaves, cut	261988	1
Bombastus	Melissa leaves, cut	273483	2
Bombastus	Melissa leaves, cut	273485	2
Bombastus	Methadone hydrochloride	14C24-B01-292858	6
Bombastus	Methadone hydrochloride	13266507	2
Bombastus	Mistletoe herb, cut	276155	2
Bombastus	Mistletoe herb, cut	277432	1
Bombastus	Mistletoe herb, cut	261875	2
Bombastus	Mistletoe herb, cut	271782	5
Bombastus	Mistletoe herb, cut	265420	1
Bombastus	Nettle leaves, cut	273229	2
Bombastus	Nettle leaves, cut	275763	4
Bombastus	Nettle leaves, cut	275848	3
Bombastus	Nettle leaves, cut	277950	3
Bombastus	Nettle leaves, cut	266638	1
Bombastus	Nettle leaves, cut	272303	3
Bombastus	Nettle leaves, cut	255763	1
Bombastus	Nettle leaves, cut	267854	1
Bombastus	Nettle leaves, cut	266099	1
Bombastus	Nettle leaves, cut	270854	6
Bombastus	Nettle leaves, cut	270987	4
Bombastus	Nettle leaves, cut	260739	1
Bombastus	Oak bark, cut	285327	3
Bombastus	Oak bark, cut	274611	3
Bombastus	Oak bark, cut	286297	1
Bombastus	Oak bark, cut	274392	3
Bombastus	Oak bark, cut	272704	2
Bombastus	Oak bark, cut	265717	1
Bombastus	Oak bark, cut	229090	1
Bombastus	Oak bark, cut	279525	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Oak bark, cut	264301	2
Bombastus	Olive tree leaves	Unbekannt	1
Bombastus	Pansy herb, cut	220232	1
Bombastus	Pansy herb, cut	270869	2
Bombastus	Pansy herb, cut	274237	2
Bombastus	Pansy herb, cut	279314	2
Bombastus	Pansy herb, cut	280890	1
Bombastus	Pansy herb, cut	282661	1
Bombastus	Pansy herb, cut	27132	1
Bombastus	Pansy herb, cut	278106	1
Bombastus	Pansy herb, cut	272832	2
Bombastus	Pansy herb, cut	276259	2
Bombastus	Peppermint leaves, cut	273843	2
Bombastus	Peppermint leaves, cut	278679	3
Bombastus	Peppermint leaves, cut	278585	1
Bombastus	Peppermint leaves, cut	281282	3
Bombastus	Peppermint leaves, cut	281043	4
Bombastus	Peppermint leaves, cut	285914	1
Bombastus	Peppermint leaves, cut	275492	1
Bombastus	Peppermint leaves, cut	279914	2
Bombastus	Peppermint leaves, cut	272956	6
Bombastus	Peppermint leaves, cut	276172	1
Bombastus	Peppermint leaves, cut	278201	2
Bombastus	Peppermint leaves, cut	267998	4
Bombastus	Peppermint leaves, cut	279634	2
Bombastus	Peppermint leaves, cut	266772	2
Bombastus	Peppermint leaves, cut	255719	1
Bombastus	Peppermint leaves, cut	282509	1
Bombastus	Peppermint leaves, cut	279214	1
Bombastus	Peppermint leaves, cut	271499	1
Bombastus	Peppermint leaves, cut	274021	2
Bombastus	Peppermint leaves, cut	275295	4
Bombastus	Peppermint leaves, cut	246514	1
Bombastus	Plantain leaves, cut	263401	2
Bombastus	Plantain leaves, cut	279569	1
Bombastus	Plantain leaves, cut	270016	4
Bombastus	Plantain leaves, cut	275479	5
Bombastus	Plantain leaves, cut	278038	1
Bombastus	Raspberry leaves, cut	272898	1
Bombastus	Raspberry leaves, cut	269870	1
Bombastus	Raspberry leaves, cut	273143	2
Bombastus	Raspberry leaves, cut	273668	4
Bombastus	Raspberry leaves, cut	279686	3
Bombastus	Raspberry leaves, cut	262836	2
Bombastus	Raspberry leaves, cut	274507	1
Bombastus	Raspberry leaves, cut	263050	6
Bombastus	Raspberry leaves, cut	273710	7
Bombastus	Raspberry leaves, cut	248586	1
Bombastus	Raspberry leaves, cut	273778	1
Bombastus	Raspberry leaves, cut	265844	1
Bombastus	Restharrow root, cut	274421	3
Bombastus	Restharrow root, cut	283708	1
Bombastus	Rhubarb root, powdered	11043806	1
Bombastus	Rosehip peel, cut	269033	1
Bombastus	Rosehip peel, cut	257166	1
Bombastus	Rosemary leaves, cut	277128	2
Bombastus	Rosemary leaves, cut	281248	1
Bombastus	Rosemary leaves, cut	270171	1
Bombastus	Rosemary leaves, cut	281843	2
Bombastus	Rosemary leaves, cut	272435	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Sage leaves, cut	277512	1
Bombastus	Sage leaves, cut	270115	1
Bombastus	Sage leaves, cut	264390	1
Bombastus	Sage leaves, cut	279929	6
Bombastus	Sage leaves, cut	271253	1
Bombastus	Sage leaves, cut	255381	1
Bombastus	Sage leaves, cut	275330	2
Bombastus	Senna leaves, cut	271828	1
Bombastus	Senna leaves, cut	275285	3
Bombastus	Senna leaves, cut	277575	4
Bombastus	Senna leaves, cut	278109	1
Bombastus	Senna leaves, cut	280008	2
Bombastus	Senna leaves, cut	280448	2
Bombastus	Senna leaves, cut	280581	2
Bombastus	Senna leaves, cut	273547	3
Bombastus	Senna leaves, cut	266901	1
Bombastus	Senna leaves, cut	273474	1
Bombastus	Shepherd's purse herb...	278856	3
Bombastus	Shepherd's purse herb...	269594	6
Bombastus	Shepherd's purse herb...	262668	1
Bombastus	Shepherd's purse herb...	12345	2
Bombastus	Shepherd's purse herb...	269977	1
Bombastus	Shepherd's purse herb...	284136	1
Bombastus	Sodium monohydrogenph...	11H04-N06	1
Bombastus	Speedwell wort, cut	265564	1
Bombastus	Speedwell wort, cut	268409	1
Bombastus	Speedwell wort, cut	274238	2
Bombastus	Speedwell wort, cut	278855	2
Bombastus	Speedwell wort, cut	269497	2
Bombastus	St. John's wort, cut	281530	1
Bombastus	St. John's wort, cut	268834	2
Bombastus	St. John's wort, cut	275106	6
Bombastus	St. John's wort, cut	265761	1
Bombastus	St. John's wort, cut	268834	2
Bombastus	Thyme, rubbed	275877	1
Bombastus	Thyme, rubbed	277996	3
Bombastus	Thyme, rubbed	278309	2
Bombastus	Thyme, rubbed	277466	1
Bombastus	Thyme, rubbed	276508	2
Bombastus	Thyme, rubbed	280782	1
Bombastus	Thyme, rubbed	243485	1
Bombastus	Thyme, rubbed	268912	1
Bombastus	Thyme, rubbed	267394	1
Bombastus	Valerian root, cut	274722	1
Bombastus	Valerian root, cut	6641B110317	3
Bombastus	Valerian root, cut	276645	2
Bombastus	Valerian root, cut	274561	1
Bombastus	Valerian root, cut	268458	2
Bombastus	Valerian root, cut	267863	1
Bombastus	Valerian root, cut	268057	1
Bombastus	Walnut leaves, cut	267575	1
Bombastus	Willow bark, cut	161594	1
Bombastus	Willow bark, cut	251385	1
Bombastus	Willow bark, cut	265845	1
Bombastus	Willow bark, cut	288869	1
Bombastus	Willow bark, cut	267927	1
Bombastus	Willow bark, cut	277005	3
Bombastus	Willow bark, cut	292710	1
Bombastus	Willow bark, cut	278458	3
Bombastus	Willow bark, cut	270886	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Bombastus	Willow bark, cut	275052	1
Bombastus	Willow bark, cut	277847	1
Bombastus	Willow bark, cut	281533	2
Bombastus	Willow bark, cut	282270	3
Bombastus	Willow bark, cut	261615	1
Bombastus	Willowherb, small-flo...	259546	2
Bombastus	Willowherb, small-flo...	268836	3
Bombastus	Willowherb, small-flo...	278235	1
Bombastus	Willowherb, small-flo...	281846	2
Bombastus	Wood betony herb, cut	12007205	2
Bombastus	Wormwood herb, cut	281000	1
Bombastus	Wormwood herb, cut	221868	1
Bombastus	Wormwood herb, cut	265417	3
Bombastus	Yarrow herb, cut	277430	2
Bombastus	Yarrow herb, cut	275964	1
Bombastus	Yarrow herb, cut	274610	2
Bombastus	Yarrow herb, cut	276498	4
Bombastus	Yarrow herb, cut	274284	3
Bombastus	Yarrow herb, cut	273273	2
Bombastus	Yarrow herb, cut	15006702	2
Bombastus	Yarrow herb, cut	278315	5
Bombastus	Yarrow herb, cut	268179	2
Bombastus	Yarrow herb, cut	279023	3
Caealo	Sodium sulfate decahy...	11294603	2
Cae	Bean-pods, cut	Int.Ch.313011	1
Cae	Bitter fennel	Int.Ch.314090	1
Caelo	Agarikon	11024502	1
Caelo	Agrimony herb, cut	10325504	1
Caelo	Agrimony herb, cut	12382901	3
Caelo	Agrimony herb, cut	12382905	5
Caelo	Agrimony herb, cut	10325503	5
Caelo	Agrimony herb, cut	11374002	4
Caelo	Agrimony herb, cut	11374006	8
Caelo	Agrimony herb, cut	9300107	1
Caelo	Agrimony herb, cut	10325505	2
Caelo	Agrimony herb, cut	12382903	1
Caelo	Agrimony herb, cut	11374004	8
Caelo	Agrimony herb, cut	3481-A-110324	1
Caelo	Agrimony herb, cut	11374005	2
Caelo	Agrimony herb, cut	21081205	1
Caelo	Agrimony herb, cut	10325501	1
Caelo	Agrimony herb, cut	9300110	1
Caelo	Agrimony herb, cut	1137407	1
Caelo	Agrimony herb, cut	10325502	2
Caelo	Alpine lady's mantle ...	1214204	1
Caelo	Alpine lady's mantle ...	12147202	3
Caelo	Alpine lady's mantle ...	12147203	1
Caelo	Alpine lady's mantle ...	12147205	2
Caelo	Alpine lady's mantle ...	12147206	3
Caelo	Alpine lady's mantle ...	12147203-3470312131	1
Caelo	Alpine lady's mantle ...	11063608	1
Caelo	Aluminium chloride he...	11229917	4
Caelo	Aluminium chloride he...	11229914	2
Caelo	Aluminium chloride he...	11229905	1
Caelo	Aluminium chloride he...	12114920	12
Caelo	Aluminium chloride he...	13/13-B03-287298	1
Caelo	Aluminium chloride he...	12127-N01	1
Caelo	Aluminium chloride he...	12047503	3
Caelo	Aluminium chloride he...	51/AD1	1
Caelo	Aluminium chloride he...	18061308	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Aluminium chloride he...	12047505	4
Caelo	Aluminium chloride he...	12021303	1
Caelo	Aluminium chloride he...	23051205	1
Caelo	Aluminium chloride he...	13L13-B03-287298	1
Caelo	Aluminium chloride he...	12114922	17
Caelo	Aluminium chloride he...	12114906	6
Caelo	Aluminium chloride he...	130701101	1
Caelo	Aluminium chloride he...	12323717	5
Caelo	Aluminium chloride he...	1233702	1
Caelo	Aluminium chloride he...	11229913	2
Caelo	Aluminium chloride he...	15080701	1
Caelo	Aluminium chloride he...	11229906	1
Caelo	Aluminium chloride he...	1406021-01	3
Caelo	Aluminium chloride he...	2313A-01095	1
Caelo	Aluminium chloride he...	15051302	1
Caelo	Aluminium chloride he...	19041302	1
Caelo	Aluminium chloride he...	11229907	1
Caelo	Aluminium chloride he...	12114919	1
Caelo	Aluminium chloride he...	12114907	1
Caelo	Aluminium chloride he...	8031301	1
Caelo	Aluminium chloride he...	5081301	1
Caelo	Aluminium chloride he...	12114910	9
Caelo	Aluminium chloride he...	3091205	1
Caelo	Aluminium chloride he...	28121301	1
Caelo	Aluminium chloride he...	27081301	1
Caelo	Aluminium chloride he...	12114904	2
Caelo	Aluminium chloride he...	12114908	11
Caelo	Aluminium chloride he...	12323703	1
Caelo	Aluminium chloride he...	13G03-N02	24
Caelo	Aluminium chloride he...	12323710	8
Caelo	Aluminium chloride he...	121149006	1
Caelo	Aluminium chloride he...	12114912	7
Caelo	Aluminium chloride he...	10251314	1
Caelo	Aluminium chloride he...	10251309	1
Caelo	Aluminium chloride he...	3113E-01095	1
Caelo	Aluminium chloride he...	10251307	1
Caelo	Aluminium chloride he...	12047514	5
Caelo	Aluminium chloride he...	1210014-01	19
Caelo	Aluminium chloride he...	23071204	1
Caelo	Aluminium chloride he...	23111203	1
Caelo	Aluminium chloride he...	121001402	2
Caelo	Aluminium chloride he...	9071303	1
Caelo	Aluminium chloride he...	15080715	1
Caelo	Aluminium potassium s...	14263804	1
Caelo	Aluminium potassium s...	504311092	1
Caelo	Aluminium potassium s...	13356103	2
Caelo	Aluminium potassium s...	12184407	5
Caelo	Aluminium potassium s...	12184402	1
Caelo	Aluminium potassium s...	12022444	1
Caelo	Aluminium potassium s...	12144605	4
Caelo	Aluminium potassium s...	12144607	2
Caelo	Aluminium potassium s...	13098702	1
Caelo	Aluminium potassium s...	12184407	3
Caelo	Aluminium potassium s...	12022409	1
Caelo	Aluminium potassium s...	12184408	3
Caelo	Aluminium potassium s...	12022406	2
Caelo	Aluminium potassium s...	12184401	1
Caelo	Aluminium potassium s...	12022406	3
Caelo	Aluminium potassium s...	11218611	3
Caelo	Aluminium potassium s...	12144603	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Aluminium potassium s...	12144602	1
Caelo	Aluminium potassium s...	90033229	1
Caelo	Aluminium potassium s...	11254805	1
Caelo	Aluminium potassium s...	11G01-N04	1
Caelo	Aluminium potassium s...	12022404	1
Caelo	Aluminium potassium s...	12022404	3
Caelo	Aluminium potassium s...	12184401	3
Caelo	Aluminium potassium s...	13025401	4
Caelo	Aluminium potassium s...	1218411	1
Caelo	Aluminium potassium s...	12184411	5
Caelo	Aluminium potassium s...	15172501	1
Caelo	Aluminium potassium s...	2713Q1092	1
Caelo	Aluminium potassium s...	12239102	2
Caelo	Aluminium potassium s...	510211092	1
Caelo	Aluminium potassium s...	13025404	1
Caelo	Aluminium potassium s...	12 24-M03	1
Caelo	Aluminium potassium s...	11017211	1
Caelo	Aluminium potassium s...	13025414	1
Caelo	Ammonium chloride	10176319	2
Caelo	Ammonium chloride	10176309	1
Caelo	Ammonium chloride	12240302	4
Caelo	Ammonium chloride	12356101	3
Caelo	Ammonium hydrogen car...	25111308	1
Caelo	Ammonium hydrogen car...	3712Q-01103	1
Caelo	Ammonium hydrogen car...	4112M-01103	1
Caelo	Ammonium hydrogen car...	72715338	2
Caelo	Ammonium hydrogen car...	3091204	1
Caelo	Ammonium hydrogen car...	12322204	1
Caelo	Ammonium hydrogen car...	9139402	1
Caelo	Ammonium hydrogen car...	23011404	1
Caelo	Ammonium hydrogen car...	11145612	3
Caelo	Ammonium hydrogen car...	23101204	1
Caelo	Ammonium hydrogen car...	13104611	1
Caelo	Ammonium hydrogen car...	13104601	1
Caelo	Ammonium hydrogen car...	12322201	1
Caelo	Ammonium hydrogen car...	24101202	1
Caelo	Amphetamine sulfate	12095607	1
Caelo	Amphetamine sulfate	15L01-B05	2
Caelo	Amphetamine sulfate	13344605	1
Caelo	Amphetamine sulfate	15193204	1
Caelo	Amphetamine sulfate	12B06-N013	1
Caelo	Amphetamine sulfate	12I24-N03	1
Caelo	Amphetamine sulfate	13344602	1
Caelo	Amphetamine sulfate	1ot067002	1
Caelo	Angelica root	274128	4
Caelo	Angelica root	12070806	1
Caelo	Angelica root	12350704	2
Caelo	Angelica root	21011402	1
Caelo	Angelica root	12350705	1
Caelo	Angelica root	12080403	1
Caelo	Angelica root	15101304	1
Caelo	Angelica root	14179506	2
Caelo	Angelica root	12345	1
Caelo	Angelica root	15162604	2
Caelo	Angelica root	11093310	1
Caelo	Angelica root	3412Q-02127	1
Caelo	Angelica root	269775	3
Caelo	Angelica root	5091303	1
Caelo	Angelica root	5162606	1
Caelo	Angelica root	28101402	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Angelica root	30011302	1
Caelo	Angelica root	16128002	1
Caelo	Angelica root	9030301	1
Caelo	Angelica root	12168701	5
Caelo	Angelica root	12168702	2
Caelo	Angelica root	14178506	1
Caelo	Angelica root	12168705	2
Caelo	Angelica root	12350701	1
Caelo	Angelica root	12350703	8
Caelo	Angelica root	11259803	1
Caelo	Angelica root	Int .Ch:318090	1
Caelo	Angelica root	10071306	1
Caelo	Angelica root	12080412	1
Caelo	Angelica root	11093304	1
Caelo	Anise	13037804	4
Caelo	Anise	15046102	3
Caelo	Anise	15283201	1
Caelo	Anise	12360801	1
Caelo	Anise	2700A140129	7
Caelo	Anise	13037803	2
Caelo	Anise	15046101	7
Caelo	Anise	15046109	2
Caelo	Anise	11370308	6
Caelo	Anise	1137033	1
Caelo	Anise	11101213	7
Caelo	Anise	13037808-3560412014	1
Caelo	Anise	11101214	7
Caelo	Anise	11101215	3
Caelo	Anise	3314E-01530	1
Caelo	Anise	13037901	1
Caelo	Anise	111101213	1
Caelo	Anise	15398603	2
Caelo	Anise	4061301	1
Caelo	Anise	11101204	1
Caelo	Anise	11101202	3
Caelo	Anise	10247203	3
Caelo	Anise	10247202	1
Caelo	Anise	13037809	13
Caelo	Anise	10081207	1
Caelo	Anise		1
Caelo	Anise	11370304	9
Caelo	Anise	5091304	1
Caelo	Anise	5061301	1
Caelo	Anise	411081/1	1
Caelo	Anise	13037808	12
Caelo	Anise	2213M-01530	1
Caelo	Anise	13037807	1
Caelo	Anise	13333908	10
Caelo	Anise	13333909	2
Caelo	Anise	13037806	2
Caelo	Anise	2215M-01530	1
Caelo	Anise	13037805	12
Caelo	Anise	2700A130527	14
Caelo	Anise	13333910	3
Caelo	Anise	21021312	1
Caelo	Anise	11370301	11
Caelo	Anise	11370302	7
Caelo	Anise	1307809	1
Caelo	Anise	133333902	1
Caelo	Anise	5121401	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Anise	13333901	6
Caelo	Anise	13037802	10
Caelo	Anise	13333906	3
Caelo	Anise	13333903	4
Caelo	Anise	11370303	13
Caelo	Anise	2916E-01530	1
Caelo	Anise, crushed	12360803	2
Caelo	Anise, crushed	12111303	3
Caelo	Anise, crushed	11242003	1
Caelo	Anise, crushed	4041302	1
Caelo	Anise, crushed	15149702	1
Caelo	Anise, crushed	23041303	1
Caelo	Anise, crushed	13149902	1
Caelo	Apple pieces, cut	12227301	1
Caelo	Arnica flower	11374105	1
Caelo	Arnica flower	122227202	1
Caelo	Arnica flower	1222702	1
Caelo	Arnica flower	12227202	1
Caelo	Arnica flower	IntCh: 212032	1
Caelo	Arnica flower	11374103	1
Caelo	Arnica flower	10207405	2
Caelo	Arnica flower	10081204	1
Caelo	Arnica flower	11259801	1
Caelo	Arnica flower	11259803	2
Caelo	Arnica flower	11285703	1
Caelo	Arnica flower	11374101	2
Caelo	Arnica flower	11374102	3
Caelo	Artichoke leaves, cut	12173307-3260315072	1
Caelo	Artichoke leaves, cut	12173302	3
Caelo	Artichoke leaves, cut	12173304	2
Caelo	Artichoke leaves, cut	12173306	2
Caelo	Artichoke leaves, cut	12173307	6
Caelo	Artichoke leaves, cut	13037603	3
Caelo	Artichoke leaves, cut	13037605	1
Caelo	Artichoke leaves, cut	nachprüfung	1
Caelo	Artichoke leaves, cut	81232298	1
Caelo	Artichoke leaves, cut	3110Q-03593	1
Caelo	Artichoke leaves, cut	2312I-03593	1
Caelo	Artichoke leaves, cut	13037608	1
Caelo	Artichoke leaves, cut	13037607	4
Caelo	Artichoke leaves, cut	11151908	2
Caelo	Artichoke leaves, cut	13310706	1
Caelo	Ash leaves, cut	9344908	1
Caelo	Ash leaves, cut	12225502	1
Caelo	Ash leaves, cut	12225504	1
Caelo	Ash leaves, cut	12225505	2
Caelo	Asparagus rhizome, cut	13071002	2
Caelo	Barberries	12217113	2
Caelo	Barberries	11058320	1
Caelo	Barberries	12217103	3
Caelo	Barberries	12217106	1
Caelo	Barberries	12217107	1
Caelo	Barberries	12217111	1
Caelo	Barberries	1221707	1
Caelo	Barberry bark, cut	11083507	1
Caelo	Barberry bark, cut	12112606	4
Caelo	Barberry bark, cut	nachprüfung	1
Caelo	Barberry bark, cut	12112608	1
Caelo	Barberry bark, cut	12112605	1
Caelo	Barberry bark, cut	12112603	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Barberry bark, cut	11083509	1
Caelo	Barberry bark, cut	55B110128	1
Caelo	Barberry bark, cut	12112601	1
Caelo	Barberry bark, cut	12112602	2
Caelo	Basil herb, rubbed	12066404	2
Caelo	Basil herb, rubbed	13048605	2
Caelo	Basil herb, rubbed	nachprüfung	1
Caelo	Basil herb, rubbed	12007008	2
Caelo	Basil herb, rubbed	13048601	2
Caelo	Basil herb, rubbed	13048605-3519411022	1
Caelo	Basil herb, rubbed	3632A110201	4
Caelo	Basil herb, rubbed	12007010	4
Caelo	Bay leaves	12299106	3
Caelo	Bean-pods, cut	1103061	1
Caelo	Bean-pods, cut	29091201	1
Caelo	Bean-pods, cut	15060905	1
Caelo	Bean-pods, cut	11030605	1
Caelo	Bean-pods, cut	11233603	2
Caelo	Bean-pods, cut	12358703	3
Caelo	Bean-pods, cut	13333801	1
Caelo	Bean-pods, cut	13333803	1
Caelo	Bean-pods, cut	1333802	1
Caelo	Bean-pods, cut	14080002	1
Caelo	Bean-pods, cut	11030604	6
Caelo	Bean-pods, cut	6031301	1
Caelo	Bean-pods, cut	8301004	1
Caelo	Bean-pods, cut	11030601	1
Caelo	Bean-pods, cut	10006504	1
Caelo	Bean-pods, cut	10006507	1
Caelo	Bearberry leaves, cut	11213005	5
Caelo	Bearberry leaves, cut	13067805-3390311080	1
Caelo	Bearberry leaves, cut	1218602	1
Caelo	Bearberry leaves, cut	13067805	7
Caelo	Bearberry leaves, cut	15051303	1
Caelo	Bearberry leaves, cut	15116201	1
Caelo	Bearberry leaves, cut	12186506	7
Caelo	Bearberry leaves, cut	12186504	1
Caelo	Bearberry leaves, cut	12186503	2
Caelo	Bearberry leaves, cut	280889	3
Caelo	Bearberry leaves, cut	12186502	2
Caelo	Bearberry leaves, cut	11213010	1
Caelo	Bearberry leaves, cut	20111210	1
Caelo	Bearberry leaves, cut	17121306	1
Caelo	Bearberry leaves, cut	8120	1
Caelo	Bearberry leaves, cut	9279515	1
Caelo	Bearberry leaves, cut	4021407	1
Caelo	Bearberry leaves, cut	13067802	2
Caelo	Bearberry leaves, cut	9279516	1
Caelo	Bearberry leaves, cut	4091301	1
Caelo	Bearberry leaves, cut	3108201204	1
Caelo	Bearberry leaves, cut	11213003	1
Caelo	Bearberry leaves, cut	5111301	1
Caelo	Bearberry leaves, cut	92795616	1
Caelo	Bearberry leaves, cut	4689145	1
Caelo	Bearberry leaves, cut	412A-01518	1
Caelo	Bearberry leaves, cut	2811Q-01518	1
Caelo	Bentonite	1307016-01	1
Caelo	Bentonite	1311014-01	1
Caelo	Bentonite	fürHerrSalloch	1
Caelo	Betamethasone-17-vale...	12a05-no8	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Bilberry fruit, dried	10273707	1
Caelo	Bilberry fruit, dried	10265603	1
Caelo	Bilberry fruit, dried	10273711	2
Caelo	Bilberry fruit, dried	10273709	1
Caelo	Bilberry fruit, dried	12183701	2
Caelo	Bilberry fruit, dried	10273708	1
Caelo	Bilberry fruit, dried	26061301	1
Caelo	Bilberry fruit, dried	13130501	3
Caelo	Bilberry fruit, dried	12183704	4
Caelo	Bilberry fruit, dried	18101307	1
Caelo	Bilberry leaves, cut	1300907	1
Caelo	Bilberry leaves, cut	12140206	2
Caelo	Bilberry leaves, cut	12140201	2
Caelo	Bilberry leaves, cut	9367603	2
Caelo	Bilberry leaves, cut	3091302	1
Caelo	Bilberry leaves, cut	5110J-01506	1
Caelo	Bilberry leaves, cut	13009907	2
Caelo	Bilberry leaves, cut	13009904	3
Caelo	Bilberry leaves, cut	10222601	1
Caelo	Bilberry leaves, cut	13009901	3
Caelo	Bilberry leaves, cut	13009903	4
Caelo	Bilberry leaves, cut	13009905	1
Caelo	Bilberry leaves, cut	23111201	1
Caelo	Bilberry leaves, cut	12140204	5
Caelo	Bilberry leaves, cut	nachprüfung	1
Caelo	Bilberry leaves, cut	12140205	1
Caelo	Birch leaves, cut	13337303-3561412013	1
Caelo	Birch leaves, cut	12193109	12
Caelo	Birch leaves, cut	13108905	9
Caelo	Birch leaves, cut	13108906	1
Caelo	Birch leaves, cut	13108916	1
Caelo	Birch leaves, cut	13108917	1
Caelo	Birch leaves, cut	13337302	1
Caelo	Birch leaves, cut	12193108	1
Caelo	Birch leaves, cut	107063	1
Caelo	Birch leaves, cut	11189507	1
Caelo	Birch leaves, cut	11189509	1
Caelo	Birch leaves, cut	11189510	3
Caelo	Birch leaves, cut	12193002	1
Caelo	Birch leaves, cut	12193003	1
Caelo	Birch leaves, cut	14360702	1
Caelo	Birch leaves, cut	261441	1
Caelo	Birch leaves, cut	11189502	2
Caelo	Birch leaves, cut	11050102	3
Caelo	Birch leaves, cut	11189501	2
Caelo	Birch leaves, cut	14360703	1
Caelo	Birch leaves, cut	3013E-01481	1
Caelo	Birch leaves, cut	nachprüfung	1
Caelo	Birch leaves, cut	IntCh:311092	1
Caelo	Bitter almonds	15193103	1
Caelo	Bitter almonds	13242001	1
Caelo	Bitter almonds	12239604	1
Caelo	Bitter almonds	5121301	1
Caelo	Bitter almonds	16221202	1
Caelo	Bitter fennel	12094719	5
Caelo	Bitter fennel	12094720	7
Caelo	Bitter fennel	12094721	2
Caelo	Bitter fennel	12094724	3
Caelo	Bitter fennel	12094717	1
Caelo	Bitter fennel	12094716	10

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Bitter fennel	12094715	6
Caelo	Bitter fennel	12094712	6
Caelo	Bitter fennel	12094710	6
Caelo	Bitter fennel	12094725	8
Caelo	Bitter fennel	27121201	1
Caelo	Bitter fennel	14376408	1
Caelo	Bitter fennel	14111301	1
Caelo	Bitter fennel	13398502	3
Caelo	Bitter fennel	13148307	3
Caelo	Bitter fennel	13148306	1
Caelo	Bitter fennel	13148304	23
Caelo	Bitter fennel	13148303	2
Caelo	Bitter fennel	12345678	1
Caelo	Bitter fennel	12094704	8
Caelo	Bitter fennel	11185501	1
Caelo	Bitter fennel	16061202	1
Caelo	Bitter fennel	15006501	2
Caelo	Bitter fennel	14376408	4
Caelo	Bitter fennel	14376406	1
Caelo	Bitter fennel	2860A110704	6
Caelo	Bitter fennel	13371610	1
Caelo	Bitter fennel	14255802	1
Caelo	Bitter fennel	14376401	1
Caelo	Bitter fennel	14376402	1
Caelo	Bitter fennel	14376405	1
Caelo	Bitter fennel	12035102	2
Caelo	Bitter fennel	1106330	1
Caelo	Bitter fennel	15443212	1
Caelo	Bitter fennel	10109010	1
Caelo	Bitter fennel	15443208	1
Caelo	Bitter fennel	11016309	1
Caelo	Bitter fennel	15443204	1
Caelo	Bitter fennel	11016318	1
Caelo	Bitter fennel	11016332	1
Caelo	Bitter fennel	11016331	5
Caelo	Bitter fennel	15006506	1
Caelo	Bitter fennel	15006507	1
Caelo	Bitter fennel	15007601	1
Caelo	Bitter fennel	15141004	1
Caelo	Bitter fennel	12094720	1
Caelo	Bitter fennel	13020801	4
Caelo	Bitter fennel	13020802	7
Caelo	Bitter fennel	1302081	1
Caelo	Bitter fennel	13200401	4
Caelo	Bitter fennel	13200402	1
Caelo	Bitter fennel	1320041	1
Caelo	Bitter fennel	12094703	2
Caelo	Bitter fennel	11016330	1
Caelo	Bitter fennel	6091201	1
Caelo	Bitter fennel	5061302	1
Caelo	Bitter fennel	4061302	1
Caelo	Bitter fennel	402311545	1
Caelo	Bitter fennel	9121305	1
Caelo	Bitter fennel	13148304-3500411070	1
Caelo	Bitter fennel	1209474	1
Caelo	Bitter fennel	12094711	1
Caelo	Bitter fennel	12094716-3408310191	1
Caelo	Bitter fennel	12094710	1
Caelo	Bitter fennel	5121401	1
Caelo	Bitter fennel	4911E-1545	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Bitter fennel	7031306	1
Caelo	Bitter fennel	12167101	1
Caelo	Bitter fennel	nachprüfung	1
Caelo	Bitter fennel	12167102	3
Caelo	Bitter fennel	2860A140612	6
Caelo	Bitter orange flower ...	13352701-3518411022	1
Caelo	Bitter orange flower ...	12266608	5
Caelo	Bitter orange flower ...	13067903	3
Caelo	Bitter orange flower ...	2712E-01445	1
Caelo	Bitter orange flower ...	12266703	3
Caelo	Bitter orange flower ...	12266605	1
Caelo	Bitter orange flower ...	12266614	1
Caelo	Bitter orange flower ...	6051301	1
Caelo	Bitter orange flower ...	11049202	1
Caelo	Bitter orange flower ...	12266601	1
Caelo	Bitter orange flower ...	12266609	1
Caelo	Bitter orange flower ...	12266611	2
Caelo	Bitter orange flower ...	12266608	2
Caelo	Bitter orange flower ...	12266705	2
Caelo	Bitter orange flower ...	12266611	2
Caelo	Bitter orange flower ...	12266707	1
Caelo	Bitter orange flower ...	12266605	1
Caelo	Bitter orange flower ...	12266708	1
Caelo	Bitter orange flower ...	13352701	1
Caelo	Bitter orange peel, cut	12067402	1
Caelo	Bitter orange peel, cut	12239203	3
Caelo	Bitter orange peel, cut	13049001	1
Caelo	Bittersweet stalks, cut	10375604	2
Caelo	Bittersweet stalks, cut	13254301	1
Caelo	Bittersweet stalks, cut	4712M-02335	1
Caelo	Bittersweet stalks, cut	132564301	1
Caelo	Bittersweet stalks, cut	10375605	1
Caelo	Bittersweet stalks, cut	10375603	2
Caelo	Bittersweet stalks, cut	103745604	1
Caelo	Black cohosh rhizome,...	10281112	1
Caelo	Black cohosh rhizome,...	13142101	1
Caelo	Black cohosh rhizome,...	13237907	1
Caelo	Black cohosh rhizome,...	13237901	2
Caelo	Black cohosh rhizome,...	10281104	1
Caelo	Black cohosh rhizome,...	10281118	2
Caelo	Black cohosh rhizome,...	13237903	1
Caelo	Black cumin seed	11233502	2
Caelo	Black cumin seed	10121915	1
Caelo	Black cumin seed	14359903	3
Caelo	Black cumin seed	13326406	1
Caelo	Black cumin seed	13326405	2
Caelo	Black cumin seed	12358906	2
Caelo	Black cumin seed	10121916	1
Caelo	Black cumin seed	11233507	1
Caelo	Black cumin seed	11233503	2
Caelo	Black cumin seed	12358902	1
Caelo	Black cumin seed	12358904	1
Caelo	Black cumin seed	12358903	2
Caelo	Black cumin seed	12358901	3
Caelo	Black mustard seed	12189307	1
Caelo	Black mustard seed	14057702	1
Caelo	Black mustard seed	13038904	1
Caelo	Black mustard seed, p...	12208601	3
Caelo	Black mustard seed, p...	12350210	1
Caelo	Black mustard seed, p...	12350211	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Black mustard seed, p...	13097701	12
Caelo	Black mustard seed, p...	13097702	4
Caelo	Black mustard seed, p...	13097705	7
Caelo	Black mustard seed, p...	13097706	2
Caelo	Black mustard seed, p...	15214703	1
Caelo	Black mustard seed, p...	15214707	1
Caelo	Black mustard seed, p...	15214713	2
Caelo	Black mustard seed, p...	16051807	1
Caelo	Black mustard seed, p...	12350209	1
Caelo	Black mustard seed, p...	23061401	1
Caelo	Black mustard seed, p...	12009702	5
Caelo	Black mustard seed, p...	12208602	7
Caelo	Black mustard seed, p...	12208604	4
Caelo	Black mustard seed, p...	12350202	14
Caelo	Black mustard seed, p...	12350205	3
Caelo	Black mustard seed, p...	12009706	2
Caelo	Black mustard seed, p...	1200970601-13	1
Caelo	Black mustard seed, p...	12350207	5
Caelo	Black mustard seed, p...	12350208	9
Caelo	Black mustard seed, p...	15214708	1
Caelo	Black mustard seed, p...	13358304	6
Caelo	Black mustard seed, p...	13358302	12
Caelo	Black mustard seed, p...	13097704	4
Caelo	Black mustard seed, p...	12009703	1
Caelo	Black mustard seed, p...	14293713	1
Caelo	Black mustard seed, p...	14162810	2
Caelo	Black mustard seed, p...	14293701	1
Caelo	Black mustard seed, p...	14293710	1
Caelo	Black mustard seed, p...	12350202-3369319012	1
Caelo	Black mustard seed, p...	14162802	1
Caelo	Black mustard seed, p...	15214706	1
Caelo	Black mustard seed, p...	15131102	1
Caelo	Black mustard seed, p...	15131101	1
Caelo	Black mustard seed, p...	14293706	1
Caelo	Black mustard seed, p...	14293702	2
Caelo	Black mustard seed, p...	2015Q-02244	1
Caelo	Black mustard seed, p...	14162807	1
Caelo	Black mustard seed, p...	25011401	2
Caelo	Black mustard seed, p...	14162810	3
Caelo	Black mustard seed, p...	14245601	1
Caelo	Black pepper	12192307	1
Caelo	Black pepper	13221110	1
Caelo	Black pepper	12192304	1
Caelo	Black pepper	11193911	1
Caelo	Black pepper	12192305	1
Caelo	Black pepper	12192306	1
Caelo	Black pepper	12192309	1
Caelo	Blackberry leaves, cut	10136412	2
Caelo	Blackberry leaves, cut	11030701	2
Caelo	Blackberry leaves, cut	11030704	4
Caelo	Blackberry leaves, cut	11030706	1
Caelo	Blackberry leaves, cut	11030707	6
Caelo	Blackberry leaves, cut	13091206	1
Caelo	Blackberry leaves, cut	13101610	1
Caelo	Blackberry leaves, cut	13127901	1
Caelo	Blackberry leaves, cut	14019010	1
Caelo	Blackberry leaves, cut	14111318	1
Caelo	Blackberry leaves, cut	nachprüfung	1
Caelo	Blackberry leaves, cut	10136408	7
Caelo	Blackberry leaves, cut	10136403	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Blackberry leaves, cut	3091303	1
Caelo	Blackberry leaves, cut	3011E-01512	1
Caelo	Blackberry leaves, cut	28061202	1
Caelo	Blackberry leaves, cut	15039301	1
Caelo	Blackberry leaves, cut	2110E-01512	1
Caelo	Blackberry leaves, cut	2271c120508	1
Caelo	Blackcurrant leaves, ...	80558228	1
Caelo	Blackcurrant leaves, ...	9373913	1
Caelo	Blackcurrant leaves, ...	12115902	2
Caelo	Blackcurrant leaves, ...	12168801	1
Caelo	Blackcurrant leaves, ...	12168810	4
Caelo	Blackcurrant leaves, ...	12168804	1
Caelo	Blackcurrants	14212501	1
Caelo	Blackcurrants	12272804	3
Caelo	Blackthorn flower	12178103	2
Caelo	Blackthorn flower	12178101	2
Caelo	Blackthorn flower	11206906	1
Caelo	Blackthorn flower	12178102	5
Caelo	Blackthorn flower	12178105	1
Caelo	Blackthorn flower	12178104	4
Caelo	Blessed thistle herb,...	10325404	2
Caelo	Blessed thistle herb,...	10325402	6
Caelo	Blessed thistle herb,...	3091301	1
Caelo	Blessed thistle herb,...	9355208	1
Caelo	Blessed thistle herb,...	103225403	1
Caelo	Blessed thistle herb,...	13025902	1
Caelo	Blessed thistle herb,...	13389701	1
Caelo	Blessed thistle herb,...	12038202	1
Caelo	Blessed thistle herb,...	4743554	1
Caelo	Blessed thistle herb,...	27111205	1
Caelo	Blessed thistle herb,...	2513A-01628	1
Caelo	Blessed thistle herb,...	13025903	3
Caelo	Blessed thistle herb,...	12038203	3
Caelo	Blessed thistle herb,...	13025901	4
Caelo	Blueweed root, cut	11374504	3
Caelo	Blueweed root, cut	11374506	2
Caelo	Blueweed root, cut	91338319	1
Caelo	Blueweed root, cut	11081803	1
Caelo	Blueweed root, cut	913Q-02134	1
Caelo	Blueweed root, cut	11374510	2
Caelo	Blueweed root, cut	6221As101202	1
Caelo	Bogbean leaves, cut	1226101	1
Caelo	Bogbean leaves, cut	1712E-01517	1
Caelo	Bogbean leaves, cut	13149001	1
Caelo	Bogbean leaves, cut	13123902	2
Caelo	Bogbean leaves, cut	13123901	2
Caelo	Bogbean leaves, cut	12226104	1
Caelo	Boldo leaves, cut	12064305	1
Caelo	Boldo leaves, cut	11016508	1
Caelo	Boldo leaves, cut	11016511	1
Caelo	Boldo leaves, cut	12064306	1
Caelo	Boldo leaves, cut	12227004	1
Caelo	Boldo leaves, cut	12227005	2
Caelo	Boldo leaves, cut	12064303	1
Caelo	Boldo leaves, cut	655456	1
Caelo	Boldo leaves, cut	11016502	1
Caelo	Boldo leaves, cut	11016506	2
Caelo	Boldo leaves, cut	11016509	1
Caelo	Buckwheat herb, cut	2051303	1
Caelo	Buckwheat herb, cut	5111302	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Buckwheat herb, cut	11212817	4
Caelo	Buckwheat herb, cut	11212612	1
Caelo	Buckwheat herb, cut	11212807	2
Caelo	Buckwheat herb, cut	11212808	2
Caelo	Buckwheat herb, cut	13051303	1
Caelo	Buckwheat herb, cut	13193203	1
Caelo	Buckwheat herb, cut	30041301	1
Caelo	Buckwheat herb, cut	11212815	1
Caelo	Burdock root, cut	13122802	1
Caelo	Burdock root, cut	13122801	2
Caelo	Burdock root, cut	12295807	1
Caelo	Burdock root, cut	12295808	1
Caelo	Burdock root, cut	10073213	1
Caelo	Burdock root, cut	107063	1
Caelo	Burdock root, cut	1100801	1
Caelo	Burdock root, cut	11100801	2
Caelo	Burdock root, cut	12295801	2
Caelo	Burdock root, cut	12295802	4
Caelo	Burdock root, cut	12295803	1
Caelo	Burdock root, cut	12295805	1
Caelo	Calamus rhizome, peeled	18011301	1
Caelo	Calamus rhizome, peeled	12066502	1
Caelo	Calamus rhizome, peeled	12066501	3
Caelo	Calamus rhizome, peeled	12056704	1
Caelo	Calamus rhizome, peeled	12056703	1
Caelo	Calamus rhizome, peeled	8031306	1
Caelo	Calamus rhizome, peeled	7061302	1
Caelo	Calamus rhizome, peeled	28121205	1
Caelo	Calamus rhizome, peeled	11054204	1
Caelo	Calamus rhizome, peeled	12056701	1
Caelo	Calamus rhizome, peeled	12239008	1
Caelo	Calamus rhizome, peeled	241013010	1
Caelo	Calamus rhizome, peeled	24081203	1
Caelo	Calamus rhizome, peeled	2211a-02173	1
Caelo	Calamus rhizome, peeled	2913M-02173	1
Caelo	Calamus rhizome, peeled	13101306	1
Caelo	Calamus rhizome, peeled	12295904	1
Caelo	Calamus rhizome, peeled	12295902	3
Caelo	Calamus rhizome, peeled	12295901	2
Caelo	Calamus rhizome, peeled	12275602	6
Caelo	Calamus rhizome, peeled	15061202	1
Caelo	Calamus rhizome, peeled	12275604-3544411013	1
Caelo	Calamus rhizome, unpe...	284875	2
Caelo	Calamus rhizome, unpe...	13127801	1
Caelo	Calamus rhizome, unpe...	12066501	1
Caelo	Calcium chloride dihy...	8237314	1
Caelo	Calcium chloride dihy...	11230915	1
Caelo	Calcium chloride dihy...	12B09-N11	1
Caelo	Calcium chloride dihy...	11230921	2
Caelo	Calcium chloride dihy...	12238401	2
Caelo	Calcium chloride dihy...	12341401	1
Caelo	Calcium chloride dihy...	12341404	2
Caelo	Calcium chloride dihy...	12341409	1
Caelo	Calcium hydrogen phos...	10135223	1
Caelo	Calcium hydrogen phos...	12212804	7
Caelo	Calcium hydrogen phos...	12212813	1
Caelo	Calcium hydrogen phos...	12212816	1
Caelo	Calcium hydrogen phos...	14011401	1
Caelo	Calcium hydrogen phos...	11287503	2
Caelo	Calcium hydrogen phos...	13170704	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Calcium hydrogen phos...	11287510	1
Caelo	Calcium hydrogen phos...	12212809	2
Caelo	Calcium hydrogen phos...	12212806	1
Caelo	Calcium hydrogen phos...	12212822	1
Caelo	Calcium hydrogen phos...	11287509	2
Caelo	Calcium hydrogen phos...	10135216	1
Caelo	Calcium hydrogen phos...	10135201	1
Caelo	Calcium hydrogen phos...	12212812	2
Caelo	Calcium hydrogen phos...	13170701	4
Caelo	Calcium hydrogen phos...	10135222	1
Caelo	Calcium sulfate dihyd...	10132403	1
Caelo	Calcium sulfate dihyd...	11164005	1
Caelo	Calcium sulfate dihyd...	12257701	1
Caelo	Calcium sulfate dihyd...	12316301	2
Caelo	Calcium sulfate dihyd...	12257703	4
Caelo	Calcium sulfate hemih...	9246322	2
Caelo	Calcium sulfate hemih...	9246320	1
Caelo	Cape aloe, cut	12338209	1
Caelo	Cape aloe, cut	12232105	1
Caelo	Cape aloe, cut	11048808	1
Caelo	Cape aloe, cut	12338206	3
Caelo	Cape aloe, cut	12338203	4
Caelo	Cape aloe, cut	12338201	4
Caelo	Cape aloe, cut	11061406	1
Caelo	Cape aloe, cut	11041402	1
Caelo	Cape aloe, cut	15283001	1
Caelo	Cape aloe, cut	25111303	1
Caelo	Cape aloe, cut	12232102	3
Caelo	Cape aloe, cut	1313M-01089	1
Caelo	Cape aloe, cut	505125	1
Caelo	Cape aloe, cut	25071402	1
Caelo	Cape aloe, powdered	12183008	1
Caelo	Cape aloe, powdered	12183009	3
Caelo	Cape aloe, powdered	12183007	1
Caelo	Cape aloe, powdered	12183013	3
Caelo	Cape aloe, powdered	14065905	1
Caelo	Cape aloe, powdered	14065906	1
Caelo	Cape aloe, powdered	15125403	1
Caelo	Cape aloe, powdered	15206507	1
Caelo	Cape aloe, powdered	12183005	2
Caelo	Cape aloe, powdered	12183001	2
Caelo	Cape aloe, powdered	11132116	1
Caelo	Cape aloe, powdered	11132116	2
Caelo	Cape aloe, powdered	11132115	1
Caelo	Caraway	1509101	1
Caelo	Caraway	1222608	1
Caelo	Caraway	12226608	4
Caelo	Caraway	12226612	9
Caelo	Caraway	12226501	8
Caelo	Caraway	11003217	7
Caelo	Caraway	11003207	1
Caelo	Caraway	15097108	2
Caelo	Caraway	12343403	1
Caelo	Caraway	13041903	1
Caelo	Caraway	12226504	1
Caelo	Caraway	13091401	1
Caelo	Caraway	12226503	4
Caelo	Caraway	11378309	1
Caelo	Caraway	13306002	7
Caelo	Caraway	13306003	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Caraway	13306004	1
Caelo	Caraway	11003211	1
Caelo	Caraway	11003201	1
Caelo	Caraway	12226601	1
Caelo	Caraway	1226608	1
Caelo	Caraway	12228601	1
Caelo	Caraway	12345	1
Caelo	Caraway	12226614	5
Caelo	Caraway	12226611	2
Caelo	Caraway	12226606	1
Caelo	Caraway	12226605	4
Caelo	Caraway	12226604	5
Caelo	Caraway	12226603	9
Caelo	Caraway	13041901	1
Caelo	Caraway	10111213	1
Caelo	Caraway	15097101	4
Caelo	Caraway	15097103	1
Caelo	Caraway	15097107	1
Caelo	Caraway	15097109	1
Caelo	Caraway	15097110	1
Caelo	Caraway	15097115	1
Caelo	Caraway	2103311537	1
Caelo	Caraway	27121202	1
Caelo	Caraway	413M	1
Caelo	Caraway	9267815	1
Caelo	Caraway	13397105	8
Caelo	Caraway	13306005	2
Caelo	Caraway	811E-01537	1
Caelo	Caraway	6111206	1
Caelo	Caraway	13306006	4
Caelo	Caraway	13306008	1
Caelo	Caraway	610E-01537	1
Caelo	Caraway	4061303	1
Caelo	Caraway	13367102	1
Caelo	Caraway	13397102	2
Caelo	Caraway	13397104	1
Caelo	Caraway, crushed	14160401	1
Caelo	Castoreum, powdered	o810I-01236	1
Caelo	Cayenne pepper, powde...	13205106	1
Caelo	Celery root, cut	12319108	1
Caelo	Celery root, cut	10270012	1
Caelo	Celery root, cut	12319107	1
Caelo	Celery root, cut	12319105	2
Caelo	Celery root, cut	10270009	1
Caelo	Chickweed herb, cut	13040503	1
Caelo	Chickweed herb, cut	13040502-3283310662	1
Caelo	Chickweed herb, cut	10359117	2
Caelo	Chickweed herb, cut	13040504	1
Caelo	Chickweed herb, cut	13254401	1
Caelo	Chickweed herb, cut	13254404	1
Caelo	Chickweed herb, cut	13254403	2
Caelo	Chickweed herb, cut	13040502	2
Caelo	Chickweed herb, cut	13040501	1
Caelo	Chickweed herb, cut	10359116	1
Caelo	Chickweed herb, cut	211e-01686	1
Caelo	Chickweed herb, cut	4551B130902	1
Caelo	Chickweed herb, cut	14212411	1
Caelo	Chickweed herb, cut	14212403	1
Caelo	Chicory herb, cut	12369101	4
Caelo	Chicory herb, cut	12034303	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Chicory herb, cut	12354302	5
Caelo	Chicory herb, cut	12354306	1
Caelo	Chicory herb, cut	12034302	3
Caelo	Chicory herb, cut	14031315	1
Caelo	Chicory herb, cut	12354304	1
Caelo	Chicory herb, cut	nachprüfung	1
Caelo	Chicory herb, cut	10325606	1
Caelo	Chicory herb, cut	12034301	4
Caelo	Chicory herb, cut	12369102	3
Caelo	Cinchona bark, cut	11238512	1
Caelo	Cinchona bark, cut	10381906	1
Caelo	Cinnamon bark, cut	13304401	2
Caelo	Cinnamon bark, cut	15151905	1
Caelo	Cinnamon bark, cut	13304415	1
Caelo	Cinnamon bark, cut	13304414	1
Caelo	Cinnamon bark, cut	12309909	1
Caelo	Cinnamon bark, cut	12309902	3
Caelo	Cinnamon bark, cut	11357909	2
Caelo	Cinnamon bark, cut	12309908	1
Caelo	Cinnamon bark, cut	11357912	2
Caelo	Cinnamon bark, cut	13231603	1
Caelo	Cinnamon bark, cut	13304402	2
Caelo	Cinnamon bark, cut	25111307	1
Caelo	Cinnamon bark, sticks	13231601	2
Caelo	Cinnamon bark, sticks	12148904	1
Caelo	Cinnamon, powdered (s...	12242806	2
Caelo	Cinnamon, powdered (s...	12242818	1
Caelo	Cinnamon, powdered (s...	12242815	1
Caelo	Cloves	12095802	1
Caelo	Cloves	11233305	1
Caelo	Cloves	14057602	1
Caelo	Cloves	13371309	1
Caelo	Cloves	12095807	4
Caelo	Cloves	12095806	2
Caelo	Cloves	13371306	1
Caelo	Cloves	5398872	1
Caelo	Cloves	2010i-01450	1
Caelo	Cloves	12266505	1
Caelo	Clubmoss herb, cut	11255016	3
Caelo	Clubmoss herb, cut	11255014	7
Caelo	Clubmoss herb, cut	11255003	2
Caelo	Clubmoss herb, cut	11255012	2
Caelo	Clubmoss herb, cut	11255011	6
Caelo	Clubmoss herb, cut	11255005	4
Caelo	Clubmoss herb, cut	11255009	5
Caelo	Clubmoss herb, cut	11255010	1
Caelo	Clubmoss herb, cut	11255017	4
Caelo	Clubmoss herb, cut	11255001	2
Caelo	Clubmoss herb, cut	11255008	13
Caelo	Clubmoss herb, cut	1310502	1
Caelo	Clubmoss herb, cut	13101501	1
Caelo	Clubmoss herb, cut	11255018	1
Caelo	Clubmoss herb, cut	9378812	1
Caelo	Cocaine hydrochloride	12329103	1
Caelo	Cocaine hydrochloride	13112102	1
Caelo	Cocaine hydrochloride	14069209	1
Caelo	Cocaine hydrochloride	C17H22CIN04	1
Caelo	Cocaine hydrochloride	13259306	1
Caelo	Cocoa shells, cut	1216907	1
Caelo	Cocoa shells, cut	12126901	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Cocoa shells, cut	12126905	2
Caelo	Cocoa shells, cut	nachprüfung	1
Caelo	Cocoa shells, cut	19011303	1
Caelo	Cocoa shells, cut	12126907	1
Caelo	Cocoa shells, cut	12126910	1
Caelo	Codeine phosphate hem...	15350703	2
Caelo	Codeine phosphate hem...	14275910	1
Caelo	Codeine phosphate hem...	1427910	1
Caelo	Codeine phosphate hem...	15219805	1
Caelo	Codeine phosphate hem...	13G03-N10	1
Caelo	Coltsfoot leaves, cut	2021B121204	16
Caelo	Coltsfoot leaves, cut	25021304	1
Caelo	Coltsfoot leaves, cut	Int.Ch:Now16081	1
Caelo	Coltsfoot leaves, cut	2021B130227	15
Caelo	Coltsfoot leaves, cut	23041302	1
Caelo	Comfrey root	2711Q-02135	1
Caelo	Comfrey root	116053	1
Caelo	Common broom herb, cut	12358802	1
Caelo	Common broom herb, cut	12358804	3
Caelo	Common broom herb, cut	12358805	1
Caelo	Common broom herb, cut	13241601	1
Caelo	Common broom herb, cut	4412Q-01680	1
Caelo	Common broom herb, cut	11132209	1
Caelo	Common centaury, cut	11097612	15
Caelo	Common centaury, cut	1523	1
Caelo	Common centaury, cut	11097609	6
Caelo	Common centaury, cut	12268602	18
Caelo	Common centaury, cut	12268601	3
Caelo	Common centaury, cut	1212E-01629	1
Caelo	Common centaury, cut	11097611	1
Caelo	Common centaury, cut	11097608	1
Caelo	Common centaury, cut	11097605	3
Caelo	Common centaury, cut	11097602	2
Caelo	Common centaury, cut	8021302	1
Caelo	Common centaury, cut	12268605	4
Caelo	Common centaury, cut	12379601	1
Caelo	Common centaury, cut	12268608	13
Caelo	Common centaury, cut	12268606	12
Caelo	Common centaury, cut	15224102	1
Caelo	Common knotgrass herb...	4312M-01674	1
Caelo	Common knotgrass herb...	12368903	1
Caelo	Common knotgrass herb...	12368904	1
Caelo	Common knotgrass herb...	14079304	1
Caelo	Common knotgrass herb...	7102427	1
Caelo	Common knotgrass herb...	8111202	1
Caelo	Common knotgrass herb...	12295704	7
Caelo	Common knotgrass herb...	12295702	3
Caelo	Common knotgrass herb...	4301A100126	2
Caelo	Common knotgrass herb...	11369301	1
Caelo	Common knotgrass herb...	12368902	7
Caelo	Copper (II) sulfate p...	10L15-N06	1
Caelo	Copper (II) sulfate p...	2913U-01317	1
Caelo	Copper (II) sulfate p...	3211M-01317	1
Caelo	Copper (II) sulfate p...	12157107	1
Caelo	Copper (II) sulfate p...	12135001	1
Caelo	Copper (II) sulfate p...	3411M-01317	1
Caelo	Coriander	14031316	1
Caelo	Coriander	13010306	2
Caelo	Coriander	12080905	1
Caelo	Coriander	13010304	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Coriander	12080901	2
Caelo	Coriander	4091305	1
Caelo	Coriander	9285707	1
Caelo	Coriander	27061305	1
Caelo	Coriander	12080906	2
Caelo	Corn poppy flower, cut	12330205	1
Caelo	Corn silk, cut	13381501	1
Caelo	Corn silk, cut	10325902	3
Caelo	Corn silk, cut	10325904	2
Caelo	Corn silk, cut	10325906	7
Caelo	Corn silk, cut	10325907	4
Caelo	Corn silk, cut	280363	1
Caelo	Corn silk, cut	11280404	2
Caelo	Corn silk, cut	10325905	2
Caelo	Corn silk, cut	13277201	1
Caelo	Corn silk, cut	3712Q-02333	1
Caelo	Corn silk, cut	13277205	1
Caelo	Corn silk, cut	13381603	1
Caelo	Corn silk, cut	11280405	11
Caelo	Cornflower flower wit...	12060205	4
Caelo	Cornflower flower wit...	12060202	2
Caelo	Cornflower flower wit...	12232501	3
Caelo	Cornflower flower wit...	11059211	2
Caelo	Cornflower flower wit...	510e-01456	1
Caelo	Cornflower flower wit...	11059209	2
Caelo	Cornflower flower wit...	10291105	1
Caelo	Cornflower flower wit...	613Q-01456	1
Caelo	Cornflower flower wit...	15206601	1
Caelo	Cornflower flower wit...	14323302	1
Caelo	Cornflower flower wit...	11059206	3
Caelo	Cornflower flower wit...	12060203	4
Caelo	Couchgrass root rhizo...	12186705	1
Caelo	Couchgrass root rhizo...	12186817	3
Caelo	Couchgrass root rhizo...	3712I-02180	1
Caelo	Couchgrass root rhizo...	nachprüfung	1
Caelo	Couchgrass root rhizo...	12186701	1
Caelo	Couchgrass root rhizo...	10349705	2
Caelo	Couchgrass root rhizo...	10349704	1
Caelo	Couchgrass root rhizo...	10049614	1
Caelo	Couchgrass root rhizo...	10049606	1
Caelo	Couchgrass root rhizo...	10049618	2
Caelo	Cowberry leaves, cut	12105203	1
Caelo	Cowberry leaves, cut	12105201	1
Caelo	Cowberry leaves, cut	12150205	1
Caelo	Cowberry leaves, cut	11334302	1
Caelo	Cubeb	11081903	1
Caelo	Cudweed flower, cut	10244408	1
Caelo	Cudweed flower, cut	12170602	1
Caelo	Cudweed flower, cut	10244407	1
Caelo	Cudweed flower, cut	512U-01473	1
Caelo	Cudweed flower, cut	10244407	1
Caelo	Cudweed flower, cut	15029505	1
Caelo	Cudweed flower, cut	11293101	5
Caelo	Cudweed flower, cut	12170603	1
Caelo	Cudweed flower, cut	12170605	2
Caelo	Curcuma rhizome, cut	12136501	2
Caelo	Curcuma rhizome, cut	12136504	2
Caelo	Curcuma rhizome, cut	12136503	2
Caelo	Curcuma rhizome, cut	12136506	2
Caelo	Curcuma rhizome, cut	12136505	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Curcuma rhizome, cut	1213650	1
Caelo	Curcuma rhizome, cut	15207601	1
Caelo	Curcuma rhizome, cut	11160405	1
Caelo	Daisies	11103201	2
Caelo	Daisies	1210a120215	1
Caelo	Daisies	11103203	2
Caelo	Daisies	12133705	1
Caelo	Daisies	12133703	1
Caelo	Daisies	11068308	1
Caelo	Dandelion herb with r...	Ch. -B.: 13019802	1
Caelo	Dandelion herb with r...	12236002	8
Caelo	Dandelion herb with r...	10121602	1
Caelo	Dandelion herb with r...	6611B100902	1
Caelo	Dandelion herb with r...	13108802	12
Caelo	Dandelion herb with r...	13108801	4
Caelo	Dandelion herb with r...	13019802	20
Caelo	Dandelion herb with r...	Int.Ch.: 318090	1
Caelo	Dandelion herb with r...	10121610	1
Caelo	Dandelion herb with r...	1103011	1
Caelo	Dandelion herb with r...	2112122165	1
Caelo	Dandelion herb with r...	11030309	5
Caelo	Dandelion herb with r...	20111202	1
Caelo	Dandelion herb with r...	12236001	4
Caelo	Dandelion herb with r...	12236003	5
Caelo	Dandelion herb with r...	7131-02165	1
Caelo	Dandelion herb with r...	7341703	1
Caelo	Dandelion herb with r...	11371903	1
Caelo	Dandelion herb with r...	11030314	5
Caelo	Dandelion herb with r...	11030313	3
Caelo	Dandelion herb with r...	13019805	2
Caelo	Dandelion herb with r...	13019801	6
Caelo	Dandelion herb with r...	13199202	1
Caelo	Dandelion herb with r...	13018902	1
Caelo	Dandelion herb with r...	8111205	1
Caelo	Dandelion herb with r...	17121305	1
Caelo	Dandelion herb with r...	13019802-3395310101	1
Caelo	Dandelion herb with r...	12236005	6
Caelo	Dandelion herb withou...	7031305	1
Caelo	Dandelion herb withou...	107063	1
Caelo	Dandelion herb withou...	11030311	1
Caelo	Dandelion herb withou...	9011403	1
Caelo	Dandelion herb withou...	11371902	1
Caelo	Dandelion herb withou...	1137907	1
Caelo	Dandelion herb withou...	13091305	1
Caelo	Dandelion herb withou...	11217109	2
Caelo	Dandelion herb withou...	11217107	1
Caelo	Dandelion herb withou...	1127102	1
Caelo	Dandelion herb withou...	11371907	1
Caelo	Dandelion herb withou...	11371904	1
Caelo	Dandelion root, cut	14376603	1
Caelo	Dandelion root, cut	14166502	1
Caelo	Dandelion root, cut	12367916	1
Caelo	Dandelion root, cut	14376602	1
Caelo	Dandelion root, cut	15407703	1
Caelo	Dandelion root, cut	14166504	1
Caelo	Dandelion root, cut	12363110	1
Caelo	Dandelion root, cut	12363109	4
Caelo	Dandelion root, cut	6621A-120606	1
Caelo	Dandelion root, cut	12363108	2
Caelo	Dandelion root, cut	1225101	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Dandelion root, cut	12363107	1
Caelo	Dandelion root, cut	12363102	3
Caelo	Dandelion root, cut	12363106	1
Caelo	Dandelion root, cut	13329704	1
Caelo	Dandelion root, cut	12363103	1
Caelo	Dandelion root, cut	13329705	1
Caelo	Dandelion root, cut	12363104	4
Caelo	Dandelion root, cut	11003307	1
Caelo	Dandelion root, cut	11003309	1
Caelo	Dandelion root, cut	11003306	1
Caelo	Dandelion root, cut	8120	1
Caelo	Dandelion root, cut	11003308	2
Caelo	Dandelion root, cut	11003312	1
Caelo	Dandelion root, cut	13329702	9
Caelo	Dandelion root, cut	10024710	1
Caelo	Dandelion root, cut	12363105	1
Caelo	Danewort root, cut	12345678	1
Caelo	Deadnettle flower	11371609	2
Caelo	Deadnettle flower	11371611	2
Caelo	Deadnettle flower	11371610	5
Caelo	Deadnettle flower	52470437	1
Caelo	Deadnettle flower	15299101	1
Caelo	Deadnettle flower	12152402	2
Caelo	Deadnettle flower	11371604	1
Caelo	Deadnettle flower	12275802	1
Caelo	Deadnettle flower	11371613	2
Caelo	Deadnettle flower	2101301	1
Caelo	Deadnettle flower	10081206	1
Caelo	Deadnettle flower	11371608	1
Caelo	Deadnettle flower	9231005	1
Caelo	Deadnettle herb with ...	11371711	2
Caelo	Deadnettle herb with ...	1137170301-15	1
Caelo	Deadnettle herb with ...	11371706	2
Caelo	Deadnettle herb with ...	11371708	4
Caelo	Deadnettle herb with ...	11371709	1
Caelo	Deadnettle herb with ...	pzn4269354	1
Caelo	Deadnettle herb with ...	11371705	1
Caelo	Deadnettle herb with ...	11371707	1
Caelo	Deadnettle herb with ...	11371703	1
Caelo	Deadnettle herb with ...	11371702	1
Caelo	Deadnettle herb with ...	11371701	1
Caelo	Devil's claw root	12031801	1
Caelo	Devil's claw root	12031806	1
Caelo	Devil's claw root	12031810	1
Caelo	Devil's claw root	12031803	2
Caelo	Devil's claw root	6331B110426	2
Caelo	Dexamphetamine sulfate	C9H13N14	1
Caelo	Dihydrocodeine hydrog...	12142508	2
Caelo	Dihydrocodeine hydrog...	12142503	2
Caelo	Dihydrocodeine hydrog...	15295905	2
Caelo	Dihydrocodeine hydrog...	15295903	2
Caelo	Dihydrocodeine hydrog...	13267603	1
Caelo	Dihydrocodeine hydrog...	13267604	2
Caelo	Dihydrocodeine hydrog...	13267608	1
Caelo	Dihydrocodeine hydrog...	15295907	1
Caelo	Dill seeds	12038302	2
Caelo	Dill seeds	2413M-01526	1
Caelo	Dill seeds	12342908	3
Caelo	Dill seeds	12289901	1
Caelo	Dill seeds	12342906	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Dill seeds	9189003	1
Caelo	Dill seeds	12342909	5
Caelo	Dill seeds	12038304	4
Caelo	Dill seeds	12342901	3
Caelo	Dill seeds	12342903	1
Caelo	Dill seeds	12342904	6
Caelo	Dill tips, cut	13007602	1
Caelo	Dill tips, cut	13007608	1
Caelo	Dill tips, cut	13007601	1
Caelo	Dill tips, cut	11295109	1
Caelo	Dill tips, cut	13007605	1
Caelo	Dithranole	12375402	1
Caelo	Dithranole	12014504	2
Caelo	Dithranole	12375305	1
Caelo	Dithranole	1212I-01274	1
Caelo	Dithranole	12236811	4
Caelo	Dithranole	13120504	1
Caelo	Dithranole	11064501	1
Caelo	Dithranole	13120503	1
Caelo	Dithranole	27111206	1
Caelo	Dithranole	APDT/3652011D	1
Caelo	Dithranole	120145041.2013	1
Caelo	Dithranole	120302501	1
Caelo	Dithranole	12375302	4
Caelo	Dithranole	120302502	2
Caelo	Dithranole	13120702	1
Caelo	Dittany white root, cut	11314702	1
Caelo	Dry beads Caelo ora...	11005813	1
Caelo	Dry beads Caelo ora...	12382204	1
Caelo	Dry beads Caelo ora...	11005811	1
Caelo	Elder flower, rubbed	10291301	1
Caelo	Elder flower, rubbed	12221904-3360319071	1
Caelo	Elder flower, rubbed	12221904	11
Caelo	Elder flower, rubbed	9297412	1
Caelo	Elder flower, rubbed	1029310	1
Caelo	Elder flower, rubbed	213E-01471	1
Caelo	Elder flower, rubbed	31051301	1
Caelo	Elder flower, rubbed	9297417	2
Caelo	Elder flower, rubbed	12221907	3
Caelo	Elder flower, rubbed	12221906	1
Caelo	Elder flower, rubbed	12221910	4
Caelo	Elder flower, rubbed	13244601	3
Caelo	Elder flower, rubbed	13244602	3
Caelo	Elder flower, rubbed	14111317	1
Caelo	Elder flower, rubbed	12221903	1
Caelo	Elder flower, rubbed	10291212	1
Caelo	Elder flower, rubbed	25091207	1
Caelo	Elder flower, rubbed	10291304	1
Caelo	Elder flower, rubbed	10291308	2
Caelo	Elder flower, rubbed	12221905	9
Caelo	Elder flower, rubbed	10291310	6
Caelo	Elder flower, rubbed	10291312	4
Caelo	Elder flower, rubbed	12221902	10
Caelo	Elderberries	12267801	1
Caelo	Elfwort root, cut	13152401	1
Caelo	Elfwort root, cut	13152402	1
Caelo	Elm bark, cut	12287902	2
Caelo	Elm bark, cut	10347204	1
Caelo	Elm bark, cut	10347203	1
Caelo	Erica herb, cut	11011209	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Erica herb, cut	11011207	1
Caelo	Erica herb, cut	9291512	1
Caelo	Erica herb, cut	11011208	1
Caelo	Erica herb, cut	13367502	1
Caelo	Erica herb, cut	19111203	1
Caelo	Erica herb, cut	11102901	1
Caelo	Erica herb, cut	28061201	1
Caelo	Eucalyptus leaves, cut	122250204	1
Caelo	Eucalyptus leaves, cut	12225203	3
Caelo	Eucalyptus leaves, cut	12225202	1
Caelo	Eucalyptus leaves, cut	11307705	2
Caelo	Eucalyptus leaves, cut	11307708	2
Caelo	Eucalyptus leaves, cut	11307706	1
Caelo	Eucalyptus leaves, cut	11307703	3
Caelo	Eucalyptus leaves, cut	9346811	2
Caelo	Eucalyptus leaves, cut	9346807	1
Caelo	Eucalyptus leaves, cut	12225206	1
Caelo	Eucalyptus leaves, cut	9346812	1
Caelo	Eyebright herb, cut	14019107	1
Caelo	Eyebright herb, cut	14019102	2
Caelo	Eyebright herb, cut	112211643	1
Caelo	Eyebright herb, cut	13180005	1
Caelo	Eyebright herb, cut	13180008	1
Caelo	Eyebright herb, cut	7051302	1
Caelo	Eyebright herb, cut	11030811	3
Caelo	Eyebright herb, cut	11030812	4
Caelo	Eyebright herb, cut	12103201	1
Caelo	Eyebright herb, cut	12103202	9
Caelo	Eyebright herb, cut	12103203	8
Caelo	Eyebright herb, cut	1213202	1
Caelo	Eyebright herb, cut	8011419	1
Caelo	Eyebright herb, cut	13180001	5
Caelo	Eyebright herb, cut	13180002	4
Caelo	Eyebright herb, cut	13180004	6
Caelo	Eyebright herb, cut	30101307	1
Caelo	Eyebright herb, cut	29011302	1
Caelo	Eyebright herb, cut	9311411	1
Caelo	Eyebright herb, cut	312052	1
Caelo	Eyebright herb, cut	11030810	1
Caelo	Fenugreek seeds	13013802	2
Caelo	Fenugreek seeds	13013805	2
Caelo	Fenugreek seeds	4912E-02803	1
Caelo	Fenugreek seeds	13013803	7
Caelo	Fenugreek seeds	13013801	2
Caelo	Fenugreek seeds	12252601	2
Caelo	Fenugreek seeds	11313205	1
Caelo	Fenugreek seeds	11313203	3
Caelo	Fenugreek seeds	1131206	1
Caelo	Fenugreek seeds	11313204	4
Caelo	Fenugreek seeds	12252603	2
Caelo	Fenugreek seeds, powd...	14377201	2
Caelo	Fenugreek seeds, powd...	14057807	1
Caelo	Fenugreek seeds, powd...	7264a110201	2
Caelo	Fenugreek seeds, powd...	14057801	1
Caelo	Fenugreek seeds, powd...	15308703	2
Caelo	Fenugreek seeds, powd...	12149607	2
Caelo	Fenugreek seeds, powd...	12149605	1
Caelo	Fenugreek seeds, powd...	13398302	1
Caelo	Ferric (III) sulfate ...	10354404	2
Caelo	Ferric (III) sulfate ...	10354412	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Ferric (III) sulfate ...	12175906	3
Caelo	Ferric (III) sulfate ...	1512210007	2
Caelo	Ferric (III) sulfate ...	10354415	1
Caelo	Ferric (III) sulfate ...	12175908	1
Caelo	Feverfew, cut	12380203	6
Caelo	Feverfew, cut	12380204	1
Caelo	Flax weed herb, cut	13007507	7
Caelo	Flax weed herb, cut	13007502	2
Caelo	Flax weed herb, cut	13007505	1
Caelo	Flax weed herb, cut	14005305	2
Caelo	Flax weed herb, cut	14005303	1
Caelo	Flax weed herb, cut	11104505	1
Caelo	Flax weed herb, cut	11104507	11
Caelo	Flaxseeds	1232006	1
Caelo	Flaxseeds	12321602	4
Caelo	Flaxseeds	12186901	2
Caelo	Flaxseeds	12092104	2
Caelo	Flaxseeds	12092103	3
Caelo	Flaxseeds	4713U02240	1
Caelo	Flaxseeds	3213A-02240	1
Caelo	Flaxseeds	28051403	1
Caelo	Flaxseeds	12321604	3
Caelo	Flaxseeds	13262704	2
Caelo	Flaxseeds	13262703	3
Caelo	Flaxseeds	13121207	1
Caelo	Flaxseeds	13412804	1
Caelo	Flaxseeds	15053702	1
Caelo	Flaxseeds	12382006	2
Caelo	Flaxseeds	12382004	3
Caelo	Flaxseeds	15321902	1
Caelo	Flaxseeds	12321606	2
Caelo	Flaxseeds	14262906	2
Caelo	Flaxseeds	18111302	1
Caelo	Flaxseeds	13296705	4
Caelo	Flaxseeds	1326703	2
Caelo	Flaxseeds	12321607	1
Caelo	Flaxseeds	12382002	2
Caelo	Flaxseeds	12092102	4
Caelo	Flaxseeds	11365504	2
Caelo	Flaxseeds	11199006	2
Caelo	Flaxseeds	11199003	1
Caelo	Flaxseeds	15006602	1
Caelo	Flaxseeds	11177305	1
Caelo	Flaxseeds	12321601	2
Caelo	Flaxseeds	28051303	1
Caelo	Flaxseeds	13262702	2
Caelo	Flaxseeds	7370A131104	2
Caelo	Flaxseeds	13296702	2
Caelo	Flaxseeds	15061201	1
Caelo	Flaxseeds	11365508	1
Caelo	Flaxseeds	11365507	4
Caelo	Flohsamen	12185504	11
Caelo	Flohsamen	13234309	1
Caelo	Flohsamen	12276510	1
Caelo	Flohsamen	13234310	3
Caelo	Flohsamen	13305903	1
Caelo	Flohsamen	13305904	2
Caelo	Flohsamen	7380a120911	1
Caelo	Flohsamen	15190306	1
Caelo	Flohsamen	15190304	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Flohsamen	15190303	4
Caelo	Flohsamen	13305910	4
Caelo	Flohsamen	13305907	5
Caelo	Flohsamen	13305906	2
Caelo	Flohsamen	9336709	1
Caelo	Flohsamen	10291206	1
Caelo	Flohsamen	10291207	7
Caelo	Flohsamen	12185502	1
Caelo	Flohsamen	12140301	7
Caelo	Flohsamen	11185811	4
Caelo	Flohsamen	11185803	1
Caelo	Flohsamen	10291204	1
Caelo	Flohsamen	10061503	1
Caelo	Flohsamen	12185508	3
Caelo	Flohsamen	12185509	6
Caelo	Flohsamen	10291205	1
Caelo	Flohsamen	12185503	3
Caelo	Frangula bark, cut	121860006	1
Caelo	Frangula bark, cut	12186004	11
Caelo	Frangula bark, cut	11340801	1
Caelo	Frangula bark, cut	12185901	8
Caelo	Frangula bark, cut	6011402	1
Caelo	Frangula bark, cut	12186005	1
Caelo	Frangula bark, cut	12186002	13
Caelo	Frangula bark, cut	11254001	3
Caelo	Frangula bark, cut	12186003	1
Caelo	Frangula bark, cut	eztetdt	1
Caelo	Frangula bark, cut	13203008	2
Caelo	Frangula bark, cut	12186006	4
Caelo	Frangula bark, cut	12186001	1
Caelo	Frangula bark, cut	1286003	1
Caelo	Frankincense granules	100546	1
Caelo	Frankincense granules	1210001	1
Caelo	Frankincense granules	13112807	1
Caelo	Frankincense granules	1210005	1
Caelo	Frankincense granules	10349210	1
Caelo	Frankincense granules	4614M-02030	1
Caelo	Frankincense granules	14107803	2
Caelo	Frankincense granules	13112803-3494411030	1
Caelo	Frankincense granules	12120008	2
Caelo	Frankincense granules	12120007	1
Caelo	Frankincense granules	12120006	3
Caelo	Frankincense granules	13112803	1
Caelo	Frankincense granules	12120012-3421310191	1
Caelo	Frankincense granules	13112801	5
Caelo	Frankincense granules	13112809	2
Caelo	Frankincense granules	12120005	5
Caelo	Fumitory herb, cut	12103406	3
Caelo	Fumitory herb, cut	12103405	10
Caelo	Fumitory herb, cut	12103404	3
Caelo	Fumitory herb, cut	12103402	5
Caelo	Fumitory herb, cut	12103401	2
Caelo	Fumitory herb, cut	1110145	1
Caelo	Fumitory herb, cut	12103407	6
Caelo	Fumitory herb, cut	72878477	1
Caelo	Fumitory herb, cut	31081201	1
Caelo	Fumitory herb, cut	1320902	2
Caelo	Fumitory herb, cut	13202905	2
Caelo	Fumitory herb, cut	13202902	15
Caelo	Fumitory herb, cut	13202901	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Fumitory herb, cut	12103408	5
Caelo	Fumitory herb, cut	11101408	1
Caelo	Fumitory herb, cut	11101405	2
Caelo	Fumitory herb, cut	11101406	2
Caelo	Fumitory herb, cut	11101410	2
Caelo	Fumitory herb, cut	11101411	5
Caelo	Fumitory herb, cut	111011411	1
Caelo	Fumitory herb, cut	8312901	1
Caelo	Fumitory herb, cut	7111201	1
Caelo	Fumitory herb, cut	11101413	5
Caelo	Galangal	12125004	3
Caelo	Galangal	11375904	1
Caelo	Galangal	12330306	2
Caelo	Galangal	12330305	2
Caelo	Galangal	12330303	1
Caelo	Galangal	1215004	1
Caelo	Galangal	15128008	1
Caelo	Galangal	13341105	1
Caelo	Gentian root, cut	Int.Ch:313091	1
Caelo	Gentian root, cut	10263411	3
Caelo	Gentian root, cut	13156102	1
Caelo	Gentian root, cut	1244603	1
Caelo	Gentian root, cut	10263405	1
Caelo	Gentian root, cut	10263403	1
Caelo	Gentian root, cut	12244607	1
Caelo	Gentian root, cut	10263404	2
Caelo	Gentian root, cut	10263406	1
Caelo	Gentian root, cut	10263413	1
Caelo	Gentian root, cut	3311i-02142	1
Caelo	Gentian root, cut	6311B130305	3
Caelo	Gentian root, cut	10263401	1
Caelo	Gentian root, cut	30011301	1
Caelo	Gentian root, cut	2913A-02142	1
Caelo	Gentian root, cut	Nachprüfung	1
Caelo	Gentian root, powdered	12007106	1
Caelo	Genuine cleaver's her...	10375708	1
Caelo	Genuine cleaver's her...	204211647	1
Caelo	Genuine cleaver's her...	10375703	2
Caelo	Genuine cleaver's her...	11265101	1
Caelo	Genuine cleaver's her...	7011301	1
Caelo	Genuine cleaver's her...	10375702	1
Caelo	Genuine cleaver's her...	12369006	6
Caelo	Genuine cleaver's her...	11265104	5
Caelo	Genuine cleaver's her...	12369002	3
Caelo	Genuine cleaver's her...	12369001	3
Caelo	Genuine cleaver's her...	11265106	1
Caelo	Genuine cleaver's her...	22041303	1
Caelo	Genuine cleaver's her...	11265105	1
Caelo	Genuine cleaver's her...	12369007	4
Caelo	Genuine cleaver's her...	24101201	1
Caelo	Genuine cleaver's her...	11265102	11
Caelo	Genuine cleaver's her...	11265103	5
Caelo	Genuine cleaver's her...	15029906	1
Caelo	Genuine cleaver's her...	14019202	1
Caelo	Genuine cleaver's her...	2401311647	1
Caelo	Genuine golden rot wo...	13386908	1
Caelo	Genuine golden rot wo...	12343102	1
Caelo	Genuine golden rot wo...	12343103-3466312121	1
Caelo	Ginger rhizome, peeled	12164911-3368319002	1
Caelo	Ginger rhizome, peeled	11325713	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Ginger rhizome, peeled	19121201	1
Caelo	Ginger rhizome, peeled	13310604	3
Caelo	Ginger rhizome, peeled	13310602	2
Caelo	Ginger rhizome, peeled	13100605	3
Caelo	Ginger rhizome, peeled	13100604	1
Caelo	Ginger rhizome, peeled	13100602	2
Caelo	Ginger rhizome, peeled	12180604	1
Caelo	Ginger rhizome, peeled	11325719	3
Caelo	Ginger rhizome, peeled	11325715	2
Caelo	Ginger rhizome, peeled	11325712	1
Caelo	Ginger rhizome, peeled	11325703	1
Caelo	Ginger rhizome, peeled...	12164901	1
Caelo	Ginger rhizome, peeled...	12164911	1
Caelo	Ginkgo leaves, cut	13340901	1
Caelo	Ginkgo leaves, cut	12151703	1
Caelo	Ginkgo leaves, cut	12151709	2
Caelo	Ginkgo leaves, cut	10315510	1
Caelo	Ginkgo leaves, cut	nachprüfung	1
Caelo	Ginkgo leaves, cut	15077407	1
Caelo	Ginkgo leaves, cut	1513E-02841	1
Caelo	Ginkgo leaves, cut	13340907	1
Caelo	Ginkgo leaves, cut	13340906	1
Caelo	Ginkgo leaves, cut	13340904	1
Caelo	Ginkgo leaves, cut	12151707	2
Caelo	Ginkgo leaves, cut	12121703	1
Caelo	Ginseng root	12080218	1
Caelo	Glucosamine sulfate 2...	1122	1
Caelo	Goat's rue herb, cut	33131-01645	1
Caelo	Goat's rue herb, cut	12017903	1
Caelo	Goat's rue herb, cut	12017913	1
Caelo	Goat's rue herb, cut	12343303	7
Caelo	Goat's rue herb, cut	12017914	1
Caelo	Goat's rue herb, cut	12343302	4
Caelo	Goat's rue herb, cut	12343308	1
Caelo	Goat's rue herb, cut	12017912	1
Caelo	Goat's rue herb, cut	12343305	3
Caelo	Goat's rue herb, cut	11307903	2
Caelo	Goat's rue herb, cut	6061203	1
Caelo	Goat's rue herb, cut	11175104	1
Caelo	Goat's rue herb, cut	12017907	3
Caelo	Goat's rue herb, cut	11307901	1
Caelo	Golden rot wort, cut	14112012	1
Caelo	Golden rot wort, cut	12343108	1
Caelo	Golden rot wort, cut	12319004	13
Caelo	Golden rot wort, cut	15061203	1
Caelo	Golden rot wort, cut	12319003	24
Caelo	Golden rot wort, cut	17091203	1
Caelo	Golden rot wort, cut	12319002	2
Caelo	Golden rot wort, cut	1810201204	1
Caelo	Golden rot wort, cut	11280310	5
Caelo	Golden rot wort, cut	11280309	3
Caelo	Golden rot wort, cut	11280307	1
Caelo	Golden rot wort, cut	112080308	1
Caelo	Golden rot wort, cut	14018404	1
Caelo	Golden rot wort, cut	12343102	5
Caelo	Golden rot wort, cut	12343101	1
Caelo	Golden rot wort, cut	12336801	1
Caelo	Golden rot wort, cut	12343104	9
Caelo	Golden rot wort, cut	12319007	28
Caelo	Golden rot wort, cut	12343105	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Golden rot wort, cut	12319006	6
Caelo	Golden rot wort, cut	12343109	1
Caelo	Golden rot wort, cut	13049001	1
Caelo	Golden rot wort, cut	13386901	2
Caelo	Golden rot wort, cut	13386903	1
Caelo	Golden rot wort, cut	6081302	1
Caelo	Golden rot wort, cut	11085605	2
Caelo	Golden rot wort, cut	4113A-01684	1
Caelo	Golden rot wort, cut	314050-1-p	1
Caelo	Golden rot wort, cut	28051302	1
Caelo	Golden rot wort, cut	20111209	1
Caelo	Golden rot wort, cut	nachprüfung	1
Caelo	Golden rot wort, cut	2513A-01684	1
Caelo	Golden rot wort, cut	11207010	3
Caelo	Golden rot wort, cut	4091302	1
Caelo	Golden rot wort, cut	4021405	1
Caelo	Golden rot wort, cut	2656153	1
Caelo	Golden rot wort, cut	12343103	16
Caelo	Golden rot wort, cut	11280308	13
Caelo	Golden rot wort, cut	11280305	3
Caelo	Golden rot wort, cut	11280301	8
Caelo	Golden rot wort, cut	27121302	1
Caelo	Ground ivy herb, cut	11052314	1
Caelo	Ground ivy herb, cut	11052311	1
Caelo	Ground ivy herb, cut	11374609	1
Caelo	Ground ivy herb, cut	11374602	1
Caelo	Ground ivy herb, cut	11052315	1
Caelo	Ground ivy herb, cut	11374615	1
Caelo	Ground ivy herb, cut	3411A-01651	1
Caelo	Ground ivy herb, cut	11052318	2
Caelo	Ground ivy herb, cut	11374611	1
Caelo	Ground ivy herb, cut	11374606	1
Caelo	Ground ivy herb, cut	11374608	3
Caelo	Ground ivy herb, cut	11374610	4
Caelo	Guaiaacum wood, cut	11352012	1
Caelo	Guaiaacum wood, cut	4011M-01778	1
Caelo	Guaiaacum wood, cut	8041401	1
Caelo	Guaiaacum wood, cut	14008203	1
Caelo	Guaiaacum wood, cut	10143014	1
Caelo	Guaiaacum wood, cut	11352001	1
Caelo	Guaiaacum wood, cut	11352008	1
Caelo	Guaiaacum wood, cut	nachprüfung	1
Caelo	Hawthorn flower	11068204	1
Caelo	Hawthorn flower	11068206	1
Caelo	Hawthorn flower	11068209	3
Caelo	Hawthorn flower	13010402	2
Caelo	Hawthorn flower	13010403	5
Caelo	Hawthorn flower	11068202	1
Caelo	Hawthorn flower	7121201	1
Caelo	Hawthorn flower	11068208	1
Caelo	Hawthorn flower	11068209	1
Caelo	Hawthorn flower	13010402	3
Caelo	Hawthorn flower	21051301	1
Caelo	Hawthorn flower	25101301	1
Caelo	Hawthorn flower	13253303	1
Caelo	Hawthorn flower	13253304	2
Caelo	Hawthorn flower	11068202	1
Caelo	Hawthorn fruit	13367203	1
Caelo	Hawthorn fruit	11278202	1
Caelo	Hawthorn fruit	13101402	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hawthorn fruit	12326308	2
Caelo	Hawthorn fruit	12326307	2
Caelo	Hawthorn fruit	12326306	1
Caelo	Hawthorn fruit	12326304	1
Caelo	Hawthorn leaves with ...	12225103	3
Caelo	Hawthorn leaves with ...	12225104	7
Caelo	Hawthorn leaves with ...	12225107	5
Caelo	Hawthorn leaves with ...	12225108	6
Caelo	Hawthorn leaves with ...	1222514	1
Caelo	Hawthorn leaves with ...	1221707	1
Caelo	Hawthorn leaves with ...	10273514	1
Caelo	Hawthorn leaves with ...	2225104	1
Caelo	Hawthorn leaves with ...	10273415	1
Caelo	Hawthorn leaves with ...	10273511	1
Caelo	Hawthorn leaves with ...	10273512	2
Caelo	Hawthorn leaves with ...	12225207	1
Caelo	Hawthorn leaves with ...	IntCh:313082	1
Caelo	Hawthorn leaves with ...	52467476	1
Caelo	Hawthorn leaves with ...	16025802	1
Caelo	Hawthorn leaves with ...	15188802	1
Caelo	Hawthorn leaves with ...	1225107	1
Caelo	Hawthorn leaves with ...	13276703	2
Caelo	Hawthorn leaves with ...	1412M-01485	1
Caelo	Hawthorn leaves with ...	1518802	1
Caelo	Hay flowers	13097301	1
Caelo	Hay flowers	12371707	1
Caelo	Hay flowers	12317108	2
Caelo	Hay flowers	12317107	12
Caelo	Hay flowers	12317104	10
Caelo	Hay flowers	12317102	2
Caelo	Hay flowers	12317101	10
Caelo	Hay flowers	11099916	1
Caelo	Hay flowers	13097302	7
Caelo	Hay flowers	11099914	3
Caelo	Hay flowers	12317110	2
Caelo	Hay flowers	3713F-01459	1
Caelo	Hay flowers	3713E-01459	1
Caelo	Hay flowers	25101202	1
Caelo	Hay flowers	14121301	1
Caelo	Hay flowers	13142402	1
Caelo	Hay flowers	13099205	1
Caelo	Hay flowers	11099915	1
Caelo	Hay flowers	11099904	1
Caelo	Hay flowers	11099912	1
Caelo	Hay flowers	11099902	1
Caelo	Hay flowers	11099910	1
Caelo	Hay flowers	11099909	3
Caelo	Heather flower, rubbed	13014206	1
Caelo	Heather flower, rubbed	10270516	1
Caelo	Heather flower, rubbed	13014204	4
Caelo	Heavy alkaline bismut. ...	10013213	1
Caelo	Heavy alkaline bismut. ...	12146913	3
Caelo	Heavy alkaline bismut. ...	4513M-01186	1
Caelo	Heavy alkaline bismut. ...	M468105	1
Caelo	Heavy alkaline bismut. ...	10F09-N13	1
Caelo	Heavy alkaline bismut. ...	12146903	7
Caelo	Heavy alkaline bismut. ...	12146902	1
Caelo	Heavy alkaline bismut. ...	11052817	1
Caelo	Heavy alkaline bismut. ...	11052812	2
Caelo	Heavy alkaline bismut. ...	11052809	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Heavy alkaline bismut...	10013208	1
Caelo	Heavy alkaline bismut...	3081205	1
Caelo	Heavy alkaline bismut...	12146909	4
Caelo	Heavy alkaline bismut...	11052805	1
Caelo	Heavy alkaline bismut...	12146911	4
Caelo	Heavy, basic magnesi...	13123502	1
Caelo	Heavy, basic magnesi...	13123504	2
Caelo	Heavy, basic magnesi...	12135401	1
Caelo	Heavy, basic magnesi...	12135404	1
Caelo	Heavy, basic magnesi...	7011404	1
Caelo	Heavy, basic magnesi...	2091303	1
Caelo	Heavy, basic magnesi...	13123505	1
Caelo	Henna leaves powder	12267311	1
Caelo	Henna leaves powder	13262803	2
Caelo	Henna leaves powder	12122310	3
Caelo	Herb Robert, cut	12319304	2
Caelo	Herb Robert, cut	12319302	2
Caelo	Herb Robert, cut	11147812	3
Caelo	Herb Robert, cut	8121203	1
Caelo	Herb Robert, cut	12319305	1
Caelo	Herb Robert, cut	11147807	5
Caelo	Herb Robert, cut	12319301	1
Caelo	Herb Robert, cut	11147810	4
Caelo	Herb Robert, cut	11147804	1
Caelo	Hibiscus flower	12007303	1
Caelo	Hibiscus flower	12267504	1
Caelo	Hibiscus flower	11036511	1
Caelo	Hibiscus flower	12007306	1
Caelo	Hibiscus flower	12267502	3
Caelo	Hibiscus flower	12267502	4
Caelo	Hibiscus flower	12267503	2
Caelo	Hibiscus flower	12267507	2
Caelo	Hibiscus flower	11036512	1
Caelo	Hibiscus flower	1431B131015	1
Caelo	Hibiscus flower	11036504	1
Caelo	Hibiscus flower	11036501	1
Caelo	Hibiscus flower	7121301	1
Caelo	Hibiscus flower	5212U-01460	1
Caelo	Hibiscus flower	11036503	1
Caelo	Hibiscus flower	12267501	3
Caelo	Hibiscus flower	12267504-3428311150	1
Caelo	Hibiscus flower	12267504	3
Caelo	Hibiscus flower	11036509	1
Caelo	Hollyhock flower, cut	13040401	3
Caelo	Hollyhock flower, cut	13040402	2
Caelo	Hollyhock flower, cut	9267604	1
Caelo	Hollyhock flower, cut	10244507	1
Caelo	Hop strobile	13123808	1
Caelo	Hop strobile	5021306	1
Caelo	Hop strobile	4111304	1
Caelo	Hop strobile	12008317	7
Caelo	Hop strobile	4212M-023337	1
Caelo	Hop strobile	30121301	1
Caelo	Hop strobile	1451B120202	8
Caelo	Hop strobile	14068007	1
Caelo	Hop strobile	12380103	1
Caelo	Hop strobile	12380101	7
Caelo	Hop strobile	12008315	1
Caelo	Hop strobile	12008311	1
Caelo	Hop strobile	13187602	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Hop strobile	12008310	4
Caelo	Hop strobile	12008309	5
Caelo	Hop strobile	6091303	1
Caelo	Hop strobile	10240320	1
Caelo	Hop strobile	12008306	1
Caelo	Hop strobile	12008307	3
Caelo	Hop strobile	12092001	5
Caelo	Hop strobile	12380102	1
Caelo	Hop strobile	12008305	4
Caelo	Hop strobile	13123803-3505411011	1
Caelo	Hop strobile	13123803	7
Caelo	Hop strobile	13123802	9
Caelo	Hop strobile	12221807	1
Caelo	Hop strobile	131223805	1
Caelo	Hop strobile	10240410	1
Caelo	Hop strobile	12006305	1
Caelo	Hop strobile	12008302	3
Caelo	Hop strobile	12008303	1
Caelo	Hop strobile	12008310	3
Caelo	Hop strobile	13123804-3563412081	1
Caelo	Hop strobile	4756769	1
Caelo	Hop strobile	10036008	1
Caelo	Hop strobile	10240308	1
Caelo	Hop strobile	13123804	3
Caelo	Hop strobile	13123807	1
Caelo	Hop strobile	14068001	1
Caelo	Hop strobile	1451b120817	2
Caelo	Hop strobile	15061211	1
Caelo	Hop strobile	13220502	1
Caelo	Hop strobile	13123806	1
Caelo	Hop strobile	12221804	1
Caelo	Hop strobile	120008312	1
Caelo	Hop strobile	12380101	1
Caelo	Hop strobile	12008312	1
Caelo	Hop strobile	12008313	2
Caelo	Hop strobile	12221802	2
Caelo	Hop strobile	12221805	6
Caelo	Hop strobile	13123802	3
Caelo	Horehound herb, cut	12231601	3
Caelo	Horehound herb, cut	1153803	1
Caelo	Horehound herb, cut	11253803	1
Caelo	Horehound herb, cut	13289109	1
Caelo	Horehound herb, cut	12231605	4
Caelo	Horehound herb, cut	11253802	1
Caelo	Horehound herb, cut	313091	1
Caelo	Horehound herb, cut	12231603	1
Caelo	Horehound herb, cut	12231604	5
Caelo	Horse chestnut leaves...	11063503	4
Caelo	Horse chestnut leaves...	11063504	2
Caelo	Horse chestnut leaves...	13126501	1
Caelo	Horsetail herbs, cut	12288802	3
Caelo	Horsetail herbs, cut	13200201	1
Caelo	Horsetail herbs, cut	12268801	1
Caelo	Horsetail herbs, cut	13159704	2
Caelo	Horsetail herbs, cut	11076303	11
Caelo	Horsetail herbs, cut	10375507	2
Caelo	Horsetail herbs, cut	2658181	1
Caelo	Horsetail herbs, cut	13091301	1
Caelo	Horsetail herbs, cut	13159702	2
Caelo	Horsetail herbs, cut	311042	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Horsetail herbs, cut	10328915	1
Caelo	Horsetail herbs, cut	10375505	2
Caelo	Horsetail herbs, cut	10375520	1
Caelo	Horsetail herbs, cut		2
Caelo	Horsetail herbs, cut	11076301	4
Caelo	Horsetail herbs, cut	13159706	3
Caelo	Horsetail herbs, cut	13344304	3
Caelo	Horsetail herbs, cut	13344306	1
Caelo	Horsetail herbs, cut	12288808	7
Caelo	Horsetail herbs, cut	11021902	1
Caelo	Horsetail herbs, cut	15015404	1
Caelo	Horsetail herbs, cut	15015402	2
Caelo	Horsetail herbs, cut	13344315	1
Caelo	Horsetail herbs, cut	13344313	1
Caelo	Horsetail herbs, cut	1288804	1
Caelo	Horsetail herbs, cut	11021901	2
Caelo	Horsetail herbs, cut	12288804	8
Caelo	Horsetail herbs, cut	11076302	3
Caelo	Horsetail herbs, cut	6081304	1
Caelo	Horsetail herbs, cut	13344309	3
Caelo	Horsetail herbs, cut	13344303	5
Caelo	Horsetail herbs, cut	12231401	6
Caelo	Horsetail herbs, cut	13159705	1
Caelo	Horsetail herbs, cut	8101201	1
Caelo	Horsetail herbs, cut	613M-01642	1
Caelo	Horsetail herbs, cut	3091201	1
Caelo	Horsetail herbs, cut	11076306	5
Caelo	Horsetail herbs, cut	11076307	2
Caelo	Hydrated sodium perbo...	13050801	2
Caelo	Hydrated sodium perbo...	13050805	1
Caelo	Hydrated sodium perbo...	13050807	1
Caelo	Hyssop herb, cut	11374303	2
Caelo	Hyssop herb, cut	13143902	1
Caelo	Hyssop herb, cut	11374304	1
Caelo	Iceland moss, cut	11101601	1
Caelo	Iceland moss, cut	11101502	1
Caelo	Iceland moss, cut	9052804	2
Caelo	Iceland moss, cut	12187107	1
Caelo	Iceland moss, cut	12187109	5
Caelo	Iceland moss, cut	13350803	4
Caelo	Iceland moss, cut	13350807	5
Caelo	Iceland moss, cut	14304401	1
Caelo	Iceland moss, cut	14304402	1
Caelo	Iceland moss, cut	4912E-01774	2
Caelo	Iceland moss, cut	12382806	1
Caelo	Iceland moss, cut	12187106	3
Caelo	Iceland moss, cut	12187102	17
Caelo	Iceland moss, cut	14304409	2
Caelo	Iceland moss, cut	12187002	3
Caelo	Iceland moss, cut	11101607	12
Caelo	Iceland moss, cut	11101604	1
Caelo	Iceland moss, cut	12187104	8
Caelo	Iceland moss, cut	11053916	1
Caelo	Iceland moss, cut	nachprüfung	1
Caelo	Iceland moss, cut	2811e-01774	1
Caelo	Iceland moss, cut	1287102	1
Caelo	Iceland moss, cut	12197002	1
Caelo	Iceland moss, cut	12187103	1
Caelo	Iceland moss, cut	12187101	2
Caelo	Iceland moss, cut	1218702	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Iceland moss, cut	14304403	2
Caelo	Iceland moss, cut	11101606	2
Caelo	Iceland moss, cut	11053911	1
Caelo	Iceland moss, cut	12198102	1
Caelo	Indian psyllium	12276511	1
Caelo	Indian psyllium	9011302	1
Caelo	Indian psyllium	3051303	1
Caelo	Indian psyllium	4121201	1
Caelo	Indian psyllium	5091319	1
Caelo	Indian psyllium	29061510	1
Caelo	Indian psyllium	12276501	2
Caelo	Indian psyllium	3051302	1
Caelo	Indian psyllium	10011303	1
Caelo	Indian psyllium	11185803	1
Caelo	Indian psyllium	11185811	2
Caelo	Indian psyllium	12252706	1
Caelo	Indian psyllium	12252709	1
Caelo	Indian psyllium	1227506	2
Caelo	Indian psyllium	413E-03369	1
Caelo	Indian psyllium	26011401	1
Caelo	Indian psyllium	19061308	1
Caelo	Indian psyllium	18071301	1
Caelo	Indian psyllium	16121302	1
Caelo	Indian psyllium	30101303	1
Caelo	Indian psyllium	4121202	1
Caelo	Indian psyllium	23011505	1
Caelo	Indian psyllium	15081503	1
Caelo	Indian psyllium	3912Q-03369	1
Caelo	Indian psyllium	14031408	1
Caelo	Indian psyllium	11061405	1
Caelo	Indian psyllium	4114001	1
Caelo	Indian psyllium	30101302	1
Caelo	Ivy leaves, cut	25021305	1
Caelo	Ivy leaves, cut	11101205	1
Caelo	Ivy leaves, cut	11229505	3
Caelo	Ivy leaves, cut	27111301	1
Caelo	Ivy leaves, cut	nachprüfung	2
Caelo	Ivy leaves, cut	23121305	1
Caelo	Ivy leaves, cut	23121303	1
Caelo	Ivy leaves, cut	20111211	1
Caelo	Ivy leaves, cut	15121205	1
Caelo	Ivy leaves, cut	15101203	1
Caelo	Ivy leaves, cut	12225605	4
Caelo	Ivy leaves, cut	12225603	3
Caelo	Ivy leaves, cut	12225602	1
Caelo	Ivy leaves, cut	410E-0149	1
Caelo	Ivy leaves, cut	8061205	1
Caelo	Ivy leaves, cut	10011401	1
Caelo	Ivy leaves, cut	1021306	1
Caelo	Ivy leaves, cut	4011301	1
Caelo	Ivy leaves, cut	11041303	1
Caelo	Ivy leaves, cut	11041304	1
Caelo	Jasmin flower	12143203	3
Caelo	Javanese curcuma root...	15120202	2
Caelo	Javanese curcuma root...	14017706	1
Caelo	Javanese curcuma root...	14309503	1
Caelo	Javanese curcuma root...	12319206	3
Caelo	Javanese curcuma root...	13262907	1
Caelo	Javanese curcuma root...	12319201	1
Caelo	Javanese curcuma root...	11046305	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Javanese curcuma root...	12319206	2
Caelo	Javanese curcuma root...	11182903	1
Caelo	Javanese curcuma root...	25041313	1
Caelo	Javanese curcuma root...	13262903	1
Caelo	Juniper berries	12113701	1
Caelo	Juniper berries	2890a101201	1
Caelo	Juniper berries	12028604	1
Caelo	Juniper berries, crus...	13031302	1
Caelo	Juniper berries, crus...	13367302	1
Caelo	Kaolin, heavy	11350115	1
Caelo	Kaolin, heavy	11350107	5
Caelo	Kaolin, heavy	13041835	1
Caelo	Kaolin, heavy	11350107	1
Caelo	Kaolin, heavy	82043269	1
Caelo	Kaolin, heavy	11041623	2
Caelo	Kaolin, heavy	13041803	2
Caelo	Kaolin, heavy	11350125	6
Caelo	Kaolin, heavy	11350106	2
Caelo	Kaolin, heavy	63033516	1
Caelo	Kaolin, heavy	13041835	3
Caelo	Kaolin, heavy	13041834	1
Caelo	Kaolin, heavy	10176530	1
Caelo	Kaolin, heavy	10176518	1
Caelo	Kaolin, heavy	11350124	4
Caelo	Kaolin, heavy	11041610	1
Caelo	Kidney vetch, coarsel...	13104301	2
Caelo	Lady's mantle herb, cut	5013I1616	1
Caelo	Lady's mantle herb, cut	11182804	5
Caelo	Lady's mantle herb, cut	1406211616	1
Caelo	Lady's mantle herb, cut	H-040513-2	1
Caelo	Lady's mantle herb, cut	1100912	1
Caelo	Lady's mantle herb, cut	11182801	5
Caelo	Lady's mantle herb, cut	11002907	4
Caelo	Lady's mantle herb, cut	11182803	1
Caelo	Lady's mantle herb, cut	3613M01616	1
Caelo	Lady's mantle herb, cut	2101211616	1
Caelo	Lady's mantle herb, cut	8121201	1
Caelo	Lady's mantle herb, cut	5041301	1
Caelo	Lady's mantle herb, cut	9346207	1
Caelo	Lady's mantle herb, cut	intch:318080	1
Caelo	Lady's mantle herb, cut	11182807	4
Caelo	Lady's mantle herb, cut	11182805	4
Caelo	Lady's mantle herb, cut	27011401	1
Caelo	Lady's mantle herb, cut	1213309	1
Caelo	Lady's mantle herb, cut	1215305	2
Caelo	Lady's mantle herb, cut	1215309	1
Caelo	Lady's mantle herb, cut	1118206	1
Caelo	Lady's mantle herb, cut	11182808	1
Caelo	Lady's mantle herb, cut	14066002	1
Caelo	Lady's mantle herb, cut	14066003	2
Caelo	Lady's mantle herb, cut	1182808	1
Caelo	Lady's mantle herb, cut	14066008	1
Caelo	Lady's mantle herb, cut	1182806	1
Caelo	Lady's mantle herb, cut	15147002	2
Caelo	Lady's mantle herb, cut	21081203	1
Caelo	Lady's mantle herb, cut	11063605	1
Caelo	Lady's mantle herb, cut	131411002	1
Caelo	Lady's mantle herb, cut	13141101	8
Caelo	Lady's mantle herb, cut	13141102	5
Caelo	Lady's mantle herb, cut	13141103	39

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lady's mantle herb, cut	13141105	3
Caelo	Lady's mantle herb, cut	13141106	9
Caelo	Lady's mantle herb, cut	13141110	1
Caelo	Lady's mantle herb, cut	13091304	1
Caelo	Lady's mantle herb, cut	9011405	1
Caelo	Lady's mantle herb, cut	12153303	8
Caelo	Lady's mantle herb, cut	12153305	28
Caelo	Lady's mantle herb, cut	12153306	9
Caelo	Lady's mantle herb, cut	12153307	3
Caelo	Lady's mantle herb, cut	12342901	1
Caelo	Lady's mantle herb, cut	125306	1
Caelo	Lady's mantle herb, cut	29131-01616	1
Caelo	Lady's mantle herb, cut	2081304	1
Caelo	Lady's mantle herb, cut	12153302	18
Caelo	Lady's mantle herb, cut	12153301	5
Caelo	Lady's mantle herb, cut	11002906	7
Caelo	Lady's mantle herb, cut	13141106-3545412081	1
Caelo	Lady's mantle herb, cut	13141103-3456311103	1
Caelo	Lady's mantle herb, cut	13141103-3400310161	1
Caelo	Lady's mantle herb, cut	13141103-3382319003	1
Caelo	Lapacho bark, cut	19061301	1
Caelo	Lapacho bark, cut	13298305	1
Caelo	Lapacho bark, cut	2x11154506	1
Caelo	Lapacho bark, cut	12239303	2
Caelo	Lapacho bark, cut	11154506	1
Caelo	Lapacho bark, cut	13298308	1
Caelo	Lapacho bark, cut	12239305	8
Caelo	Lavender flower	13185006	1
Caelo	Lavender flower	13185002	1
Caelo	Lavender flower	13185001	23
Caelo	Lavender flower	13159601	1
Caelo	Lavender flower	12088006	4
Caelo	Lavender flower	1318501	1
Caelo	Lavender flower	27091202	1
Caelo	Lavender flower	19071303	1
Caelo	Lavender flower	15061209	1
Caelo	Lavender flower	15061201	1
Caelo	Lavender flower	13387204	1
Caelo	Lavender flower	13336008	1
Caelo	Lavender flower	12088005	4
Caelo	Lavender flower	6091304	1
Caelo	Lavender flower	313A-01462	1
Caelo	Lavender flower	12088003	14
Caelo	Lavender flower	11327903	13
Caelo	Lavender flower	13185003	11
Caelo	Lavender flower	13185001-3415310152	1
Caelo	Lavender flower	13185001-3389311070	1
Caelo	Lavender flower	11054104	2
Caelo	Lavender flower	12088002	4
Caelo	Lavender flower	12088001	1
Caelo	Lavender flower	12031302	1
Caelo	Lavender flower	11327905	2
Caelo	Lavender flower	11305403	1
Caelo	Lavender flower	11054107	1
Caelo	Lavender flower	11054106	4
Caelo	Lemon grass, cut	11301503	1
Caelo	Lemon grass, cut	11301509	4
Caelo	Lemon grass, cut	13341301	1
Caelo	Lemon grass, cut	13149703	1
Caelo	Lemon grass, cut	13149701	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lemon grass, cut	11301501	1
Caelo	Lemon peel, cut	12217402	1
Caelo	Lemon peel, cut	12217404	1
Caelo	Lemon peel, cut	12217401	1
Caelo	Lemon verbena, cut	13037702	1
Caelo	Lemon verbena, cut	12137507	3
Caelo	Lemon verbena, cut	10018208	1
Caelo	Lemon verbena, cut	12137505	1
Caelo	Lime flower, cut	12170701	1
Caelo	Lime flower, cut	1210702	1
Caelo	Lime flower, cut	11086307	3
Caelo	Lime flower, cut	9206604	1
Caelo	Lime flower, cut	11086306	1
Caelo	Lime flower, cut	268709	4
Caelo	Lime flower, cut	11086301	1
Caelo	Lime flower, cut	10273606	1
Caelo	Lime flower, cut	12170703	2
Caelo	Lime flower, cut	12170702-3355319071	1
Caelo	Lime flower, cut	13101701	5
Caelo	Lime flower, cut	13337403-348012102	1
Caelo	Lime flower, cut	25091206	1
Caelo	Lime flower, cut	1913E-01474	1
Caelo	Lime flower, cut	15111301	1
Caelo	Lime flower, cut	15068302	1
Caelo	Lime flower, cut	13337403	5
Caelo	Lime flower, cut	13101708	1
Caelo	Lime flower, cut	13101702	9
Caelo	Lime flower, cut	272958	7
Caelo	Lime flower, cut	Int.Ch:210140	1
Caelo	Lime flower, cut	3212M-01474	1
Caelo	Lime flower, cut	28031302	1
Caelo	Lime flower, cut	11086305	8
Caelo	Lime leaves, cut	1611A121120	1
Caelo	Liquorice root, peeled	277004	1
Caelo	Liquorice root, peeled	6381A-121126	1
Caelo	Liquorice root, peeled	24131-02151	1
Caelo	Liquorice root, peeled	13194101	6
Caelo	Liquorice root, peeled	13104503	2
Caelo	Liquorice root, peeled	12227101	1
Caelo	Liquorice root, peeled	1135904	1
Caelo	Liquorice root, peeled	11351911	5
Caelo	Liquorice root, peeled	11351903	1
Caelo	Liquorice root, peeled	11351906	3
Caelo	Liquorice root, peeled	11351905	5
Caelo	Liquorice root, peeled	11351904	1
Caelo	Liquorice root, peeled	11351910	2
Caelo	Liquorice root, peeled	12227112	1
Caelo	Liquorice root, peeled	13104504	5
Caelo	Liquorice root, unpee...	10110912	1
Caelo	Liquorice root, unpee...	281844	2
Caelo	Liquorice root, unpee...	13037904	1
Caelo	Liquorice root, unpee...		1
Caelo	Liquorice root, unpee...	13037902	1
Caelo	Liquorice root, unpee...	12267104	3
Caelo	Liquorice root, unpee...	12267103	1
Caelo	Lovage root, cut	107063	1
Caelo	Lovage root, cut	12189001	1
Caelo	Lovage root, cut	11181611	3
Caelo	Lovage root, cut	12169008	1
Caelo	Lovage root, cut	10249313	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Lovage root, cut	11181609	2
Caelo	Lovage root, cut	1181608	1
Caelo	Lovage root, cut	13385005	1
Caelo	Lovage root, cut	12169002	1
Caelo	Lovage root, cut	4312M-02150	1
Caelo	Lungwort herb, cut	11021709	2
Caelo	Lungwort herb, cut	11134203	14
Caelo	Lungwort herb, cut	13029304	6
Caelo	Lungwort herb, cut	11134201	1
Caelo	Lungwort herb, cut	11134202	3
Caelo	Lungwort herb, cut	13029306	1
Caelo	Lungwort herb, cut	13029302	25
Caelo	Lungwort herb, cut	11021707	2
Caelo	Lungwort herb, cut	713M-01675	1
Caelo	Lungwort herb, cut	4331b111205	1
Caelo	Lungwort herb, cut	13355801	1
Caelo	Lungwort herb, cut	11134205	3
Caelo	Magnesium chloride he...	13194701	1
Caelo	Magnesium chloride he...	1304C004	2
Caelo	Magnesium chloride he...	12354618	2
Caelo	Magnesium chloride he...	12354615	6
Caelo	Magnesium chloride he...	13194702	2
Caelo	Magnesium chloride he...	5210I-01828	1
Caelo	Magnesium chloride he...	4013E-01828	1
Caelo	Magnesium chloride he...	16094004	1
Caelo	Magnesium chloride he...	1512I-01828	1
Caelo	Magnesium chloride he...	13194721	1
Caelo	Magnesium chloride he...	13194713	1
Caelo	Magnesium chloride he...	13194707	2
Caelo	Magnesium chloride he...	13194706	2
Caelo	Magnesium chloride he...	12354613	6
Caelo	Magnesium chloride he...	11345623	2
Caelo	Magnesium chloride he...	11345615	1
Caelo	Magnesium chloride he...	11345609	1
Caelo	Magnesium chloride he...	11345606	1
Caelo	Magnesium chloride he...	1108024-01	2
Caelo	Magnesium chloride he...	9L15-N01	1
Caelo	Magnesium chloride he...	1021401	1
Caelo	Magnesium chloride he...	1.02.14	1
Caelo	Magnesium chloride he...	13194713-3490312103	1
Caelo	Magnesium chloride he...	12354608	1
Caelo	Magnesium chloride he...	12354606	5
Caelo	Magnesium chloride he...	11345624	2
Caelo	Magnesium chloride he...	12141811	2
Caelo	Magnesium chloride he...	12141814	1
Caelo	Magnesium chloride he...	12141817	3
Caelo	Magnesium chloride he...	12354610	2
Caelo	Magnesium chloride he...	12354609	7
Caelo	Magnesium chloride he...	12354604	3
Caelo	Magnesium chloride he...	12354605	5
Caelo	Magnesium chloride he...	12354612	6
Caelo	Magnesium chloride he...	12141808	1
Caelo	Magnesium chloride he...	12141806	2
Caelo	Magnesium chloride he...	12141803	1
Caelo	Magnesium sulfate hep...	12336915	4
Caelo	Magnesium sulfate hep...	13030104	1
Caelo	Magnesium sulfate hep...	12c27-n06	1
Caelo	Magnesium sulfate hep...	12336942	1
Caelo	Magnesium sulfate hep...	12336926	3
Caelo	Magnesium sulfate hep...	13183709	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Magnesium sulfate hep...	12336914	7
Caelo	Magnesium sulfate hep...	13030107	1
Caelo	Magnesium sulfate hep...	13183702	2
Caelo	Magnesium sulfate hep...	12138521	6
Caelo	Magnesium sulfate hep...	12138516	6
Caelo	Magnesium sulfate hep...	3612E-01835	1
Caelo	Magnesium sulfate hep...	90744129	1
Caelo	Magnesium sulfate hep...	12336916	3
Caelo	Magnesium sulfate hep...	11231005	1
Caelo	Magnesium sulfate hep...	10104201	1
Caelo	Magnesium sulfate hep...	12119901/2	1
Caelo	Magnesium sulfate hep...	11369526	17
Caelo	Magnesium sulfate hep...	11369525	7
Caelo	Magnesium sulfate hep...	11369252	1
Caelo	Magnesium sulfate hep...	10371111	1
Caelo	Magnesium sulfate hep...	11194001	1
Caelo	Magnesium sulfate hep...	11231006	2
Caelo	Magnesium sulfate hep...	1218521	2
Caelo	Magnesium sulfate hep...	1213E-01835	1
Caelo	Magnesium sulfate hep...	12138522	2
Caelo	Magnesium sulfate hep...	12138515	2
Caelo	Magnesium sulfate hep...	12119906/2	1
Caelo	Magnesium sulfate hep...	11231025	2
Caelo	Magnesium sulfate hep...	11369509	1
Caelo	Magnesium sulfate hep...	11369529	1
Caelo	Magnesium sulfate hep...	113695625	1
Caelo	Magnesium sulfate, dr...	12157202	1
Caelo	Magnesium sulfate, dr...	11265908	2
Caelo	Magnesium sulfate, dr...	11265903	1
Caelo	Magnesium sulfate, dr...	11265902	1
Caelo	Magnesium sulfate, dr...	10213213	2
Caelo	Magnesium sulfate, dr...	12157207	1
Caelo	Magnesium sulfate, dr...	12157208	1
Caelo	Magnesium sulfate, dr...	M-220413-2	1
Caelo	Mallow flower, cut	9311104	1
Caelo	Mallow flower, cut	11040106	10
Caelo	Mallow flower, cut	11040105	1
Caelo	Mallow flower, cut	13267301-3409310112	1
Caelo	Mallow flower, cut	8121202	1
Caelo	Mallow flower, cut	13267301	7
Caelo	Mallow flower, cut	20061201	1
Caelo	Mallow flower, cut	11040101	2
Caelo	Mallow flower, cut	12187401	1
Caelo	Mallow flower, cut	12187404	6
Caelo	Mallow flower, cut	10357903	1
Caelo	Mallow flower, cut	12187501-3414310132	1
Caelo	Mallow flower, cut	12187505	2
Caelo	Mallow flower, cut	10357902	3
Caelo	Mallow flower, cut	12187402	12
Caelo	Mallow flower, cut	13351309	1
Caelo	Mallow flower, cut	13351307	1
Caelo	Mallow flower, cut	13351303	2
Caelo	Mallow flower, cut	13040402	1
Caelo	Mallow flower, cut	13267302	1
Caelo	Mallow flower, cut	13267303	2
Caelo	Mallow flower, cut	13351301	3
Caelo	Mallow flower, cut	18111303	1
Caelo	Mallow flower, cut	Nachprüfung	1
Caelo	Mallow flower, cut	10357904	1
Caelo	Mallow flower, cut	12187405	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Mallow flower, cut	3912E-01464	1
Caelo	Mallow flower, cut	12187501	5
Caelo	Mallow flower, cut	27021301	1
Caelo	Mallow flower, cut	12187502	1
Caelo	Mallow flower, cut	23051205	1
Caelo	Mallow leaves, cut	12310006	1
Caelo	Mallow leaves, cut	12310004	5
Caelo	Mallow leaves, cut	12310001	3
Caelo	Mallow leaves, cut	12153403	1
Caelo	Mallow leaves, cut	10290517	1
Caelo	Mallow leaves, cut	10290515	1
Caelo	Mallow leaves, cut	10290510	1
Caelo	Mallow leaves, cut	10290502	2
Caelo	Mallow leaves, cut	12310008	1
Caelo	Mallow leaves, cut	3912A-01501	1
Caelo	Mallow leaves, cut	28061203	1
Caelo	Mallow leaves, cut	20111302	1
Caelo	Mallow leaves, cut	1412M-01501	1
Caelo	Mallow leaves, cut	14073902	1
Caelo	Mallow leaves, cut	13174217	1
Caelo	Mallow leaves, cut	13174213	1
Caelo	Mallow leaves, cut	12310009	2
Caelo	Manganese sulfate mon. ...	91547399	1
Caelo	Manganese sulfate mon. ...	123825	1
Caelo	Manna, cut	11041401	1
Caelo	Manna, cut	11308907	6
Caelo	Manna, cut	25071403	1
Caelo	Manna, cut	14001310	1
Caelo	Manna, cut	25111301	1
Caelo	Manna, cut	14001303	2
Caelo	Manna, cut	11061404	1
Caelo	Manna, cut	11308901	2
Caelo	Manna, cut	11308911	4
Caelo	Manna, cut	11308909	2
Caelo	Manna, cut	13127003	6
Caelo	Manna, cut	2713M-01843	1
Caelo	Manna, cut	1308913	1
Caelo	Manna, cut	28101404	1
Caelo	Manna, powdered	11308802	2
Caelo	Manna, powdered	15101306	1
Caelo	Manna, powdered	15101312	1
Caelo	Manna, powdered	11308909	1
Caelo	Manna, powdered	11003611	1
Caelo	Manna, powdered	14001402	1
Caelo	Manna, powdered	11071311	1
Caelo	Manna, powdered	11308807	1
Caelo	Manna, powdered	11308907	1
Caelo	Marian thistle fruit	15409204	2
Caelo	Marian thistle fruit	27111203	1
Caelo	Marian thistle fruit	46111-02233	1
Caelo	Marian thistle fruit	Ch.B. : 11126702	1
Caelo	Marian thistle fruit	13326202	3
Caelo	Marian thistle fruit	1289112	2
Caelo	Marian thistle fruit	12189116	2
Caelo	Marian thistle fruit	12189115	3
Caelo	Marian thistle fruit	12189113	8
Caelo	Marian thistle fruit	13342003	1
Caelo	Marian thistle fruit	12198107	1
Caelo	Marian thistle fruit	10270614	5
Caelo	Marian thistle fruit	12189105	9

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Marian thistle fruit	10270615	4
Caelo	Marian thistle fruit	12189104	4
Caelo	Marian thistle fruit	11126701,	1
Caelo	Marian thistle fruit	1126705	1
Caelo	Marian thistle fruit	11126701	2
Caelo	Marian thistle fruit	11126703	3
Caelo	Marian thistle fruit	11126705	3
Caelo	Marian thistle fruit	1126704	1
Caelo	Marian thistle fruit	12189106	4
Caelo	Marian thistle fruit	1126703	1
Caelo	Marian thistle fruit	912a-02233	1
Caelo	Marian thistle fruit	12189112	14
Caelo	Marian thistle fruit	10270610	3
Caelo	Marian thistle fruit	12189111	4
Caelo	Marian thistle fruit	10270613	1
Caelo	Marian thistle fruit	10270612	2
Caelo	Marian thistle fruit	12189107	3
Caelo	Marian thistle fruit	12189108	4
Caelo	Marian thistle fruit	12189109	4
Caelo	Marian thistle fruit	18111301	1
Caelo	Marian thistle herb, ...	10315909	2
Caelo	Marian thistle herb, ...	10365602	3
Caelo	Marian thistle herb, ...	10365603	1
Caelo	Marian thistle herb, ...	10365604	5
Caelo	Marian thistle herb, ...	10365605	1
Caelo	Marian thistle herb, ...	13130701	3
Caelo	Marian thistle herb, ...	13130702	4
Caelo	Marian thistle herb, ...		1
Caelo	Marian thistle herb, ...	intch:318080	1
Caelo	Marian thistle herb, ...	62607127	1
Caelo	Marian thistle herb, ...	30101306	1
Caelo	Marian thistle herb, ...	18041303	1
Caelo	Marian thistle herb, ...	13130704	4
Caelo	Marian thistle herb, ...	10365601	9
Caelo	Marian thistle herb, ...	10315911	3
Caelo	Marian thistle herb, ...	10315910	1
Caelo	Marian thistle herb, ...	10315907	1
Caelo	Marian thistle herb, ...	10315906	1
Caelo	Marian thistle herb, ...	13130703	2
Caelo	Marian thistle herb, ...	13130701-3492411030	1
Caelo	Marian thistle herb, ...	1035911	1
Caelo	Marigold flower witho...	12221508	1
Caelo	Marigold flower witho...	12221511	1
Caelo	Marigold flower witho...	12221513	1
Caelo	Marigold flower witho...	12221705	1
Caelo	Marigold flower witho...	12221706	2
Caelo	Marigold flower witho...	12221710	1
Caelo	Marigold flower witho...	12221708	3
Caelo	Marigold flower witho...	15291501	1
Caelo	Marigold flower witho...	13235503	3
Caelo	Marigold flower witho...	12221709	1
Caelo	Marigold flower witho...	13235501	1
Caelo	Marigold flower witho...	12221707	1
Caelo	Marigold flower witho...	12221510-3435311151	1
Caelo	Marigold flower witho...	12221510-3356319071	1
Caelo	Marigold flower, cut	13235501	3
Caelo	Marigold flower, cut	27101201	1
Caelo	Marigold flower, cut	12221502	2
Caelo	Marigold flower, cut	22061203	1
Caelo	Marigold flower, cut	21091301	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Marigold flower, cut	19111206	1
Caelo	Marigold flower, cut	12221503	1
Caelo	Marigold flower, cut	10291904	4
Caelo	Marigold flower, cut	13235506	1
Caelo	Marigold flower, cut	12221708	8
Caelo	Marigold flower, cut	12221601	5
Caelo	Marigold flower, cut	1187612	3
Caelo	Marigold flower, cut	11187616	1
Caelo	Marigold flower, cut	11187612	15
Caelo	Marigold flower, cut	18121301	1
Caelo	Marigold flower, cut	12221705	4
Caelo	Marigold flower, cut	31121202	1
Caelo	Marigold flower, cut	12221707	3
Caelo	Marigold flower, cut	12221710	2
Caelo	Marigold flower, cut	AKD1	1
Caelo	Marigold flower, cut	122221704	1
Caelo	Marigold flower, cut	10117006	1
Caelo	Marigold flower, cut	12221704	15
Caelo	Marigold flower, cut	15040301	1
Caelo	Marigold flower, cut	13410202	1
Caelo	Marigold flower, cut	1325502	1
Caelo	Marigold flower, cut	295556	1
Caelo	Marigold flower, cut	12221506	1
Caelo	Marigold flower, cut	12221507	1
Caelo	Marigold flower, cut	12221701	2
Caelo	Marigold flower, cut	13235502	10
Caelo	Marigold flower, cut	11187607	4
Caelo	Marigold flower, cut	10117004	3
Caelo	Marigold flower, cut	9121303	1
Caelo	Marigold flower, cut	12071201	1
Caelo	Marigold flower, cut	11221409	2
Caelo	Marigold flower, cut	11187611	5
Caelo	Marigold flower, cut	11221407	2
Caelo	Marigold flower, cut	3061301	1
Caelo	Marigold flower, cut	5021305	1
Caelo	Marigold flower, cut	8041302	1
Caelo	Marigold flower, cut	11187610	5
Caelo	Marjoram herb, rubbed	12168910	10
Caelo	Marjoram herb, rubbed	11212713	1
Caelo	Marjoram herb, rubbed	11212711	3
Caelo	Marjoram herb, rubbed	11212708	2
Caelo	Marjoram herb, rubbed	13113304	3
Caelo	Marjoram herb, rubbed	27011402	1
Caelo	Marjoram herb, rubbed	12168907	3
Caelo	Marjoram herb, rubbed	12168908	9
Caelo	Marjoram herb, rubbed	12168912	1
Caelo	Marjoram herb, rubbed	13113303	3
Caelo	Marjoram herb, rubbed	11212704	1
Caelo	Marjoram herb, rubbed	12168909	5
Caelo	Marjoram herb, rubbed	12168906	3
Caelo	Marjoram herb, rubbed	12168905	2
Caelo	Marjoram herb, rubbed	12168904	1
Caelo	Marjoram herb, rubbed	12168903	10
Caelo	Marjoram herb, rubbed	12168902	1
Caelo	Marjoram herb, rubbed	11212707	2
Caelo	Marjoram herb, rubbed	6051302	1
Caelo	Marjoram herb, rubbed	9292602	1
Caelo	Marjoram herb, rubbed	11212710	1
Caelo	Marjoram herb, rubbed	12168901	4
Caelo	Marshmallow leaves, cut	12328202	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Marshmallow leaves, cut	12328206	4
Caelo	Marshmallow leaves, cut	12328207	2
Caelo	Marshmallow leaves, cut	11101002	1
Caelo	Marshmallow root, pee...	11101906	1
Caelo	Marshmallow root, pee...	12147311	1
Caelo	Marshmallow root, pee...	11101809	1
Caelo	Marshmallow root, pee...	11101804	1
Caelo	Masterwort rhizome, cut	12101804	1
Caelo	Masterwort rhizome, cut	12101806	2
Caelo	Masterwort rhizome, cut	13341201	1
Caelo	Masterwort rhizome, cut	13132002	1
Caelo	Masterwort rhizome, cut	1210801	1
Caelo	Masterwort rhizome, cut	12101808	1
Caelo	Masterwort rhizome, cut	12101807	2
Caelo	Mate leaves, cut	11091703	1
Caelo	Mate leaves, cut	12133803	3
Caelo	Mate leaves, cut	2141A111213	18
Caelo	Mate leaves, cut	13118001	1
Caelo	Mate leaves, cut	12133807	8
Caelo	Mate leaves, cut	12133804	5
Caelo	Mate leaves, cut	12133801	2
Caelo	Mate leaves, cut	11091710	1
Caelo	Mate leaves, cut	13061202	1
Caelo	Matricaria flower	12361707	5
Caelo	Matricaria flower	12059606	2
Caelo	Matricaria flower	12244804	2
Caelo	Matricaria flower	12244803	1
Caelo	Matricaria flower	13288405	2
Caelo	Matricaria flower	12361706	1
Caelo	Matricaria flower	12361704	1
Caelo	Matricaria flower	12361703	5
Caelo	Matricaria flower	12244602	1
Caelo	Matricaria flower	12337601	2
Caelo	Matricaria flower	12337607	3
Caelo	Matricaria flower	13111201	1
Caelo	Matricaria flower	13031306	1
Caelo	Matricaria flower	12337608	2
Caelo	Matricaria flower	12361706	1
Caelo	Matricaria flower	12361707	2
Caelo	Matricaria flower	12299703	1
Caelo	Matricaria flower	12294804	1
Caelo	Matricaria flower	13011406	1
Caelo	Matricaria flower	12294802	1
Caelo	Matricaria flower	12361701	4
Caelo	Matricaria flower	11214810	1
Caelo	Matricaria flower	11214805	1
Caelo	Matricaria flower	11101203	1
Caelo	Matricaria flower	10081201	1
Caelo	Matricaria flower	5081201	1
Caelo	Matricaria flower	11169607	1
Caelo	Matricaria flower	11218501	1
Caelo	Matricaria flower	13061201	1
Caelo	Matricaria flower	13210905	1
Caelo	Matricaria flower	13288403	1
Caelo	Matricaria flower	121111903	1
Caelo	Matricaria flower	12299701	1
Caelo	Matricaria flower	1229804	1
Caelo	Matricaria flower	12294809	1
Caelo	Matricaria flower	12294804	3
Caelo	Matricaria flower	12294802	18

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Matricaria flower	12244803	3
Caelo	Matricaria flower	12244802	5
Caelo	Matricaria flower	12111904	2
Caelo	Matricaria flower	11214802	3
Caelo	Matricaria flower	13288410	1
Caelo	Matricaria flower	13210901-3546411013	1
Caelo	Matricaria flower	13210901	2
Caelo	Matricaria flower	IntCh:313011	1
Caelo	Matricaria flower	AKD5	1
Caelo	Matricaria flower	26081303	1
Caelo	Matricaria flower	19111207	1
Caelo	Matricaria flower	31051314	1
Caelo	Matricaria flower	22011303	1
Caelo	Matricaria flower	22081202	1
Caelo	Matricaria flower	27091203	1
Caelo	Matricaria flower	19041306	1
Caelo	Matricaria flower	13210905	3
Caelo	Matricaria flower	13210906	1
Caelo	Matricaria flower	14276804	1
Caelo	Matricaria flower	15090003	2
Caelo	Matricaria flower	15258504	1
Caelo	Matricaria flower	22111201	1
Caelo	Matricaria flower	22111202	1
Caelo	Matricaria flower	16111202	1
Caelo	Matricaria flower	17101204	1
Caelo	Meadowsweet flower, r...	12275704-3372319032	1
Caelo	Meadowsweet flower, r...	10349306	1
Caelo	Meadowsweet flower, r...	1225702	1
Caelo	Meadowsweet flower, r...	9326213	3
Caelo	Meadowsweet flower, r...	10051301	1
Caelo	Meadowsweet herb, cut	4912E-01685	1
Caelo	Meadowsweet herb, cut	62487517	1
Caelo	Meadowsweet herb, cut	12188805	11
Caelo	Meadowsweet herb, cut	19071203	1
Caelo	Meadowsweet herb, cut	12188704	1
Caelo	Meadowsweet herb, cut	12188801	1
Caelo	Meadowsweet herb, cut	10381601	1
Caelo	Meadowsweet herb, cut	12188702	1
Caelo	Meadowsweet herb, cut	12188703	2
Caelo	Meadowsweet herb, cut	12188803	10
Caelo	Meadowsweet herb, cut	12188806	3
Caelo	Meadowsweet herb, cut	12188807	1
Caelo	Melilot herb, cut	25101205	1
Caelo	Melilot herb, cut	nachprüfung	1
Caelo	Melilot herb, cut	12231703	3
Caelo	Melilot herb, cut	12289003	1
Caelo	Melilot herb, cut	12289203	4
Caelo	Melilot herb, cut	11307601	4
Caelo	Melilot herb, cut	11307606	8
Caelo	Melilot herb, cut	12289201	1
Caelo	Melilot herb, cut	12289202	10
Caelo	Melilot herb, cut	25091301	1
Caelo	Melilot herb, cut	24081202	1
Caelo	Melilot herb, cut	22111303	1
Caelo	Melilot herb, cut	12289207	1
Caelo	Melilot herb, cut	12289206	1
Caelo	Melilot herb, cut	12289205	3
Caelo	Melilot herb, cut	19071201	1
Caelo	Melilot herb, cut	10335410	1
Caelo	Melilot herb, cut	612M-01664	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Melilot herb, cut	10335403	1
Caelo	Melilot herb, cut	11307602	2
Caelo	Melilot herb, cut	107063	1
Caelo	Melilot herb, cut	8061204	1
Caelo	Melilot herb, cut	11307607	2
Caelo	Melissa leaves, cut	12032308	1
Caelo	Melissa leaves, cut	12032307	2
Caelo	Melissa leaves, cut	19041303	1
Caelo	Melissa leaves, cut	12032309	2
Caelo	Melissa leaves, cut	12032311	1
Caelo	Melissa leaves, cut	12032315	1
Caelo	Melissa leaves, cut	12032316	2
Caelo	Melissa leaves, cut	12032303	3
Caelo	Melissa leaves, cut	12032314	7
Caelo	Melissa leaves, cut	10310912	1
Caelo	Melissa leaves, cut	10310914	1
Caelo	Melissa leaves, cut	10310918	1
Caelo	Melissa leaves, cut	10310921	1
Caelo	Melissa leaves, cut	1009	1
Caelo	Melissa leaves, cut	12032302	1
Caelo	Melissa leaves, cut	12032319	4
Caelo	Melissa leaves, cut	2161a120718	1
Caelo	Melissa leaves, cut	2161a121009	1
Caelo	Melissa leaves, cut	24011407	1
Caelo	Melissa leaves, cut	25021301	1
Caelo	Melissa leaves, cut	25061303	1
Caelo	Melissa leaves, cut		3
Caelo	Melissa leaves, cut	CH. 111111	1
Caelo	Melissa leaves, cut	10310919	1
Caelo	Melissa leaves, cut	13030801	1
Caelo	Melissa leaves, cut	13030803	2
Caelo	Melissa leaves, cut	13030804	1
Caelo	Melissa leaves, cut	13030805	1
Caelo	Melissa leaves, cut	13214705	1
Caelo	Melissa leaves, cut	13214707	1
Caelo	Melissa leaves, cut	14111319	1
Caelo	Melissa leaves, cut	12032310	2
Caelo	Methadone hydrochloride	15244702	1
Caelo	Methadone hydrochloride	15244709	2
Caelo	Methadone hydrochloride	13266515	1
Caelo	Methadone hydrochloride	13266512	2
Caelo	Methadone hydrochloride	10076407	1
Caelo	Methadone hydrochloride	11227507	1
Caelo	Methadone hydrochloride	12171902	1
Caelo	Methadone hydrochloride	12171906	2
Caelo	Methadone hydrochloride	12171907	1
Caelo	Methadone hydrochloride	15244706	3
Caelo	Methadone hydrochloride	13266518	3
Caelo	Methadone hydrochloride	12344807	1
Caelo	Methadone hydrochloride	12344814	2
Caelo	Methadone hydrochloride	12344816	3
Caelo	Methadone hydrochloride	12344818	2
Caelo	Methadone hydrochloride	1327H051	1
Caelo	Methadone hydrochloride	14C24-B01-292860	1
Caelo	Methadone hydrochloride	15215501	1
Caelo	Methadone hydrochloride	12171914	1
Caelo	Methadone hydrochloride	13266505	4
Caelo	Methadone hydrochloride	17011406	1
Caelo	Methadone hydrochloride	12344802	1
Caelo	Methadone hydrochloride	12344810	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Methadone hydrochloride	13266501	1
Caelo	Methadone hydrochloride	12344812	2
Caelo	Methadone hydrochloride	12344819	1
Caelo	Methadone hydrochloride	12171918	1
Caelo	Methadone hydrochloride	13266504	2
Caelo	Midazolam hydrochloride	14339008	2
Caelo	Midazolam hydrochloride	11184705	1
Caelo	Midazolam hydrochloride	2061508	1
Caelo	Midazolam hydrochloride	12094512	1
Caelo	Midazolam hydrochloride	15224605	1
Caelo	Midazolam hydrochloride	15224607	1
Caelo	Midazolam hydrochloride	14339002	1
Caelo	Milkvetch, powdered	12285403	2
Caelo	Milkvetch, powdered	13204701	5
Caelo	Milkvetch, powdered	13204702	1
Caelo	Milkvetch, powdered	15085602	1
Caelo	Milkvetch, powdered	14162207	1
Caelo	Milkvetch, powdered	14162205	4
Caelo	Milkvetch, powdered	13277802	3
Caelo	Milkvetch, powdered	13277801	1
Caelo	Milkvetch, powdered	13204703	3
Caelo	Milkvetch, powdered	12285405	1
Caelo	Milkvetch, powdered	12108806	2
Caelo	Milkvetch, powdered	8081201	1
Caelo	Milkvetch, powdered	13204705	6
Caelo	Milkvetch, powdered	14011302	1
Caelo	Milkvetch, powdered	13095208	3
Caelo	Milkvetch, powdered	15041302	1
Caelo	Milkvetch, powdered	15041303	1
Caelo	Milkvetch, powdered	13277804	3
Caelo	Milkvetch, powdered	9081202	1
Caelo	Milkvetch, powdered	20111305	1
Caelo	Milkvetch, powdered	15121203	1
Caelo	Milkvetch, powdered	1327802	1
Caelo	Milkvetch, powdered	12285402	1
Caelo	Milkvetch, powdered	15085602	3
Caelo	Milkvetch, powdered	15085606	1
Caelo	Milkvetch, powdered	7021402	1
Caelo	Milkvetch, powdered	12108801	1
Caelo	Milkvetch, powdered	13095203	1
Caelo	Milkvetch, powdered	14162204	1
Caelo	Mistletoe herb, cut	29061201	1
Caelo	Mistletoe herb, cut	28101304	1
Caelo	Mistletoe herb, cut	11266709	8
Caelo	Mistletoe herb, cut	11266712-3450311162	1
Caelo	Mistletoe herb, cut	29071302	1
Caelo	Mistletoe herb, cut	29081302	1
Caelo	Mistletoe herb, cut	29101302	1
Caelo	Mistletoe herb, cut	3813E-01695	1
Caelo	Mistletoe herb, cut	4313E-01695	1
Caelo	Mistletoe herb, cut	11294005	10
Caelo	Mistletoe herb, cut	11266703	5
Caelo	Mistletoe herb, cut	11266705	5
Caelo	Mistletoe herb, cut	11266708	6
Caelo	Mistletoe herb, cut	11266710	6
Caelo	Mistletoe herb, cut	11266712	6
Caelo	Mistletoe herb, cut	11266714	4
Caelo	Mistletoe herb, cut	11266702	4
Caelo	Mistletoe herb, cut	10273407	2
Caelo	Mistletoe herb, cut	6061306	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Mistletoe herb, cut	10081205	1
Caelo	Mistletoe herb, cut	10273412	3
Caelo	Mistletoe herb, cut	10273418	1
Caelo	Mistletoe herb, cut	11021303	1
Caelo	Mistletoe herb, cut	11294002	2
Caelo	Mistletoe herb, cut	18031303	1
Caelo	Mistletoe herb, cut	20121303	1
Caelo	Mistletoe herb, cut	23111204	1
Caelo	Mistletoe herb, cut	24011401	1
Caelo	Mistletoe herb, cut	26071302	1
Caelo	Mistletoe herb, cut	27121305	1
Caelo	Mistletoe herb, cut	17061304	1
Caelo	Mistletoe herb, cut	11294003	3
Caelo	Mistletoe herb, cut	11294004	5
Caelo	Mistletoe herb, cut	12011301	1
Caelo	Mistletoe herb, cut	1266711	1
Caelo	Mistletoe herb, cut	14034209	1
Caelo	Mistletoe herb, cut	14292506	2
Caelo	Mistletoe herb, cut	14292514	1
Caelo	Mistletoe herb, cut	10273420	9
Caelo	Mistletoe herb, cut	11266704	15
Caelo	Molecular distilled g...	11160012	1
Caelo	Monk's pepper fruit	12016903	1
Caelo	Monk's pepper fruit	13193404	1
Caelo	Monk's pepper fruit	13193401	2
Caelo	Monk's pepper fruit	nachprüfung	1
Caelo	Monk's pepper fruit	3413A-03015	1
Caelo	Monk's pepper fruit	13193403	1
Caelo	Monk's pepper fruit	12274013	2
Caelo	Monk's pepper fruit	12274012	1
Caelo	Monk's pepper fruit	12274010	10
Caelo	Monk's pepper fruit	13193406	3
Caelo	Monk's pepper fruit	12016908	1
Caelo	Monk's pepper fruit	11026318	1
Caelo	Monk's pepper fruit	11026309	1
Caelo	Monk's pepper fruit	1513546	1
Caelo	Monk's pepper fruit	80175158	2
Caelo	Monk's pepper fruit	15065105	1
Caelo	Monk's pepper fruit	14194408	1
Caelo	Monk's pepper fruit	13193410	2
Caelo	Monk's pepper fruit	12016905	2
Caelo	Monk's pepper fruit	12274002	1
Caelo	Monk's pepper fruit	12016907	1
Caelo	Monk's pepper fruit	12274003	7
Caelo	Monk's pepper fruit	12274006	2
Caelo	Monk's pepper fruit	12274009	2
Caelo	Monk's pepper fruit	12274001	1
Caelo	Monk's pepper fruit	12016909	4
Caelo	Monk's pepper fruit	12016904	1
Caelo	Morphine hydrochloride	13125206	1
Caelo	Morphine hydrochloride	15439409	1
Caelo	Morphine hydrochloride	15199705Nr.3	1
Caelo	Morphine hydrochloride	12104403	1
Caelo	Morphine hydrochloride	12104409	1
Caelo	Morphine hydrochloride	12318101	1
Caelo	Morphine hydrochloride	15439405	1
Caelo	Morphine hydrochloride	15199711	4
Caelo	Morphine hydrochloride	1543904	1
Caelo	Morphine hydrochloride	15199705Nr.2	1
Caelo	Morphine hydrochloride	15199705	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Morphine hydrochloride	13081310	1
Caelo	Morphine hydrochloride	14238604	1
Caelo	Morphine hydrochloride	14055084	1
Caelo	Motherwort herb, cut	2712E-01658	1
Caelo	Motherwort herb, cut	11293004	3
Caelo	Motherwort herb, cut	nachprüfung	1
Caelo	Motherwort herb, cut	12376408	1
Caelo	Motherwort herb, cut	12231503	2
Caelo	Motherwort herb, cut	12376402	1
Caelo	Motherwort herb, cut	12376407	1
Caelo	Motherwort herb, cut	12376403	1
Caelo	Motherwort herb, cut	5061203	1
Caelo	Motherwort herb, cut	11293003	1
Caelo	Motherwort herb, cut	10244610	1
Caelo	Mouse-ear hawkweed, cut	3611b111005	1
Caelo	Mugwort herb, cut	10357806	1
Caelo	Mugwort herb, cut	12382702	8
Caelo	Mugwort herb, cut	12382701	8
Caelo	Mugwort herb, cut	12016705	9
Caelo	Mugwort herb, cut	12016702	2
Caelo	Mugwort herb, cut	9355403	1
Caelo	Mugwort herb, cut	12016709	3
Caelo	Mugwort herb, cut	3591A110119	4
Caelo	Mugwort herb, cut	1081301	1
Caelo	Mugwort herb, cut	12016701	1
Caelo	Mugwort herb, cut	10355329	1
Caelo	Mugwort herb, cut	12382705	2
Caelo	Mugwort herb, cut	4712A-01620	1
Caelo	Mugwort herb, cut	3591A100315	1
Caelo	Mugwort herb, cut	14360605	1
Caelo	Mugwort herb, cut	1238701	1
Caelo	Mullein flower, cut	12192905	6
Caelo	Mullein flower, cut	12192904	1
Caelo	Mullein flower, cut	10156901	1
Caelo	Mullein flower, cut	12170903	3
Caelo	Mullein flower, cut	11333402	1
Caelo	Mullein flower, cut	12317104	1
Caelo	Mullein flower, cut	18031301	1
Caelo	Mullein flower, cut	13229701	2
Caelo	Mullein flower, cut	11233401	6
Caelo	Mullein flower, cut	12192903	5
Caelo	Mullein flower, cut	11020713	5
Caelo	Mullein flower, cut	11020708	1
Caelo	Mullein flower, cut	12192901	4
Caelo	Mullein flower, cut	11020802	1
Caelo	Mullein flower, cut	11366403	2
Caelo	Mullein flower, cut	16081201	1
Caelo	Mullein flower, cut	12170906	1
Caelo	Mullein flower, cut	13229702	1
Caelo	Mullein flower, cut	12192902	1
Caelo	Mullein flower, cut	12192907	3
Caelo	Mullein flower, cut	11233402	1
Caelo	Mullein flower, cut	11020902	1
Caelo	Mullein flower, cut	12170901	1
Caelo	Mullein flower, cut	613M-01475	1
Caelo	Mullein flower, cut	11020711	1
Caelo	Mustard seed, white, ...	12375705	4
Caelo	Mustard seed, white, ...	12375701	1
Caelo	Mustard seed, white, ...	7254a110823	1
Caelo	Mustard seed, white, ...	12375702	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Mustard seed, white, ...	12375705	1
Caelo	Mustard seed, white, ...	13224804	3
Caelo	Mustard seed, white, ...	12375706	2
Caelo	Mustard seed, white, ...	12375704	1
Caelo	Myrrh	Nachprüfung	1
Caelo	Myrrh	30121413	1
Caelo	Myrrh	13108701	3
Caelo	Myrrh	12269904	3
Caelo	Myrrh	25071404	1
Caelo	Myrrh	10057916	1
Caelo	Myrrh	12269901	2
Caelo	Myrrh	12244406	1
Caelo	Myrrh	12244411	1
Caelo	Myrrh	11276810	1
Caelo	Myrrh	11277111	1
Caelo	Myrrh	11277105	1
Caelo	Myrrh	11277111	1
Caelo	Myrrh	28101401	1
Caelo	Myrrh	11276811	2
Caelo	Myrrh	14244602	1
Caelo	Myrrh	12269913	1
Caelo	Myrrh	12305709	1
Caelo	Myrrh	12244404	1
Caelo	Myrrh	12269907	1
Caelo	Myrrh	11276806	3
Caelo	Nettle leaves, cut	12183914	11
Caelo	Nettle leaves, cut	12184005	6
Caelo	Nettle leaves, cut	10282807	1
Caelo	Nettle leaves, cut	12184001	6
Caelo	Nettle leaves, cut	10291409	1
Caelo	Nettle leaves, cut	10282806	1
Caelo	Nettle leaves, cut	20111306	1
Caelo	Nettle leaves, cut	12184004	10
Caelo	Nettle leaves, cut	10291413	2
Caelo	Nettle leaves, cut	10291414	3
Caelo	Nettle leaves, cut	12183908-3391311070	1
Caelo	Nettle leaves, cut	12183908-3405310181	1
Caelo	Nettle leaves, cut	12183908	5
Caelo	Nettle leaves, cut	1218707	1
Caelo	Nettle leaves, cut	12183908-3443311112	1
Caelo	Nettle leaves, cut	12195001	10
Caelo	Nettle leaves, cut	12184707	9
Caelo	Nettle leaves, cut	12183911	16
Caelo	Nettle leaves, cut	12183910	11
Caelo	Nettle leaves, cut	12184706	5
Caelo	Nettle leaves, cut	10291422	4
Caelo	Nettle leaves, cut	12183909	1
Caelo	Nettle leaves, cut	10291410	2
Caelo	Nettle leaves, cut	10291411	3
Caelo	Nettle leaves, cut	12034402	4
Caelo	Nettle leaves, cut	12034403	8
Caelo	Nettle leaves, cut	10162712	1
Caelo	Nettle leaves, cut	19091205	1
Caelo	Nettle leaves, cut	29071303	1
Caelo	Nettle leaves, cut	83374109	1
Caelo	Nettle leaves, cut	2051302	1
Caelo	Nettle leaves, cut	83142389	1
Caelo	Nettle leaves, cut	72085497	1
Caelo	Nettle leaves, cut	613A-03054	1
Caelo	Nettle leaves, cut	7031302	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Nettle leaves, cut	12034414	1
Caelo	Nettle leaves, cut	1283910	1
Caelo	Nettle leaves, cut	120375901	1
Caelo	Nettle leaves, cut	3021401	1
Caelo	Nettle leaves, cut	33/AD1	1
Caelo	Nettle leaves, cut	13091302	1
Caelo	Nettle leaves, cut	13386801	1
Caelo	Nettle leaves, cut	14344907	1
Caelo	Nettle leaves, cut	17121205	1
Caelo	Nettle leaves, cut	12184502	2
Caelo	Nettle leaves, cut	12354001	1
Caelo	Nettle leaves, cut	18071202	1
Caelo	Nettle leaves, cut	12195001	1
Caelo	Nettle leaves, cut	12195101	4
Caelo	Nettle leaves, cut	intch:313011	1
Caelo	Nettle leaves, cut	nachprüfung	1
Caelo	Nettle leaves, cut	12184503	3
Caelo	Nettle leaves, cut	12814001	1
Caelo	Nettle root, cut	6441A121024	1
Caelo	Nettle root, cut	11265002	6
Caelo	Nettle root, cut	11254904	3
Caelo	Nettle root, cut	11254903	5
Caelo	Nettle root, cut	11254902	5
Caelo	Nettle root, cut	10250203	1
Caelo	Nettle root, cut	10081202	1
Caelo	Nettle root, cut	11265003	2
Caelo	Nettle root, cut	11265006	1
Caelo	Nettle root, cut	6631B130610	1
Caelo	Nettle seeds	13010612	2
Caelo	Nettle seeds	15290602	1
Caelo	Nettle seeds	13010607	1
Caelo	Nettle seeds	20111301	1
Caelo	Nettle seeds	16327001	1
Caelo	Nettle seeds	13387109	1
Caelo	Nettle seeds	12131505	1
Caelo	Nutmeg	12376802	2
Caelo	Nutmeg	12376805	1
Caelo	Nutmeg, powdered (spi...	12102305	2
Caelo	Nutmeg, powdered (spi...	12102306	1
Caelo	Nystatin	12158021	7
Caelo	Nystatin	12158020	1
Caelo	Nystatin	12158019	3
Caelo	Nystatin	12158009	1
Caelo	Nystatin	12158006	6
Caelo	Nystatin	12158005	1
Caelo	Nystatin	12158004	4
Caelo	Nystatin	12158022	1
Caelo	Nystatin	11069724	1
Caelo	Nystatin	C129330	1
Caelo	Nystatin	15335310	1
Caelo	Nystatin	13173401	17
Caelo	Nystatin	13101202	1
Caelo	Nystatin	13101201	1
Caelo	Nystatin	12158004	1
Caelo	Nystatin	12138021	2
Caelo	Nystatin	11069730	1
Caelo	Nystatin	11069719	1
Caelo	Nystatin	11069716	1
Caelo	Nystatin	11069706	2
Caelo	Nystatin	3101201	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Nystatin	2091304	1
Caelo	Nystatin	1/0913	2
Caelo	Nystatin	11069731	1
Caelo	Nystatin	120700902	1
Caelo	Nystatin	12017015	2
Caelo	Nystatin	12017011	3
Caelo	Nystatin	12017010	2
Caelo	Nystatin	12017003	1
Caelo	Nystatin	12017004	5
Caelo	Nystatin	12017009	1
Caelo	Oak bark, cut	15146103	1
Caelo	Oak bark, cut	15146101	1
Caelo	Oak bark, cut	15146101	2
Caelo	Oak bark, cut	14277004	1
Caelo	Oak bark, cut	14277004	2
Caelo	Oak bark, cut	14277004	1
Caelo	Oak bark, cut	13360312	1
Caelo	Oak bark, cut	15146104	3
Caelo	Oak bark, cut	5091302	1
Caelo	Oak bark, cut	3041301	1
Caelo	Oak bark, cut	15314904	1
Caelo	Oak bark, cut	15146109	1
Caelo	Oak bark, cut	15146105	1
Caelo	Oak bark, cut	15146105	4
Caelo	Oak bark, cut	15146104	1
Caelo	Oak bark, cut	13360311	1
Caelo	Oak bark, cut	13360305	1
Caelo	Oak bark, cut	11351201	3
Caelo	Oak bark, cut	11351206	14
Caelo	Oak bark, cut	11351207	12
Caelo	Oak bark, cut	11351207-3384310110	1
Caelo	Oak bark, cut	1081401	1
Caelo	Oak bark, cut	11351209	10
Caelo	Oak bark, cut	10061504	1
Caelo	Oak bark, cut	13360309	1
Caelo	Oak bark, cut	13360306	1
Caelo	Oak bark, cut	13360306	2
Caelo	Oak bark, cut	13360304	1
Caelo	Oak bark, cut	13360302	5
Caelo	Oak bark, cut	123test	1
Caelo	Oak bark, cut	11351210	6
Caelo	Oak bark, cut	11351208	3
Caelo	Oak bark, cut	7021302	1
Caelo	Oak bark, cut	17101208	1
Caelo	Oak bark, cut	16081305	1
Caelo	Oak bark, cut	15146110	1
Caelo	Oak bark, cut	14111316	1
Caelo	Oak bark, cut	13360301	1
Caelo	Oak bark, cut	12221105	2
Caelo	Oak bark, cut	19032013	2
Caelo	Oak bark, cut	10348605	1
Caelo	Oak bark, cut	nachprüfung	1
Caelo	Oak bark, cut	41109-4-P	1
Caelo	Oak bark, cut	26081302	1
Caelo	Oak bark, cut	26061206	1
Caelo	Oak bark, cut	2413M-01303	1
Caelo	Oak bark, cut	22081204	1
Caelo	Oak bark, cut	12221104	3
Caelo	Oak bark, cut	11351203	2
Caelo	Oak bark, cut	11351202	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Oak bark, cut	10348615	2
Caelo	Oak bark, cut	10348613	2
Caelo	Oak bark, cut	10348612	3
Caelo	Oak bark, cut	10348606	1
Caelo	Oak bark, cut	11351205	4
Caelo	Oak bark, cut	12221102	1
Caelo	Oak bark, cut	12221101	11
Caelo	Oak bark, cut	11351210	1
Caelo	Oak bark, powdered	10261513	1
Caelo	Oat straw, cut	11280019	1
Caelo	Oat straw, cut	11280017	2
Caelo	Oat straw, cut	11280012	2
Caelo	Oat straw, cut	11280015	3
Caelo	Oat straw, cut	11280006	2
Caelo	Oat straw, cut	11280010	1
Caelo	Oat straw, cut	11280008	3
Caelo	Oat straw, cut	11280011	1
Caelo	Oat straw, cut	11280014	1
Caelo	Olive tree leaves	12159805	1
Caelo	Olive tree leaves	12159803	1
Caelo	Orange peel, cut	531A091125	1
Caelo	Ortisophon leaves, cut	11212901	2
Caelo	Ortisophon leaves, cut	1121905	1
Caelo	Ortisophon leaves, cut	11212905	2
Caelo	Ortisophon leaves, cut	12225704	5
Caelo	Ortisophon leaves, cut	2221A110825	3
Caelo	Ortisophon leaves, cut	12225702	1
Caelo	Ortisophon leaves, cut	11212904	1
Caelo	Ortisophon leaves, cut	13258804	3
Caelo	Ortisophon leaves, cut	23051203	1
Caelo	Ortisophon leaves, cut	31081207	1
Caelo	Ortisophon leaves, cut	31121203	1
Caelo	Ortisophon leaves, cut	14121-01507	1
Caelo	Ortisophon leaves, cut	20111207	1
Caelo	Ortisophon leaves, cut	13258801	2
Caelo	Ortisophon leaves, cut	13258802	2
Caelo	Ortisophon leaves, cut	13258803	1
Caelo	Ortisophon leaves, cut	21061304	1
Caelo	Ortisophon leaves, cut	28101305	1
Caelo	Pale echinacea purp. ...	12244504	1
Caelo	Pale echinacea purp. ...	11115206	1
Caelo	Pansy herb, cut	5021304	1
Caelo	Pansy herb, cut	12189204-3458312120	1
Caelo	Pansy herb, cut	1289203	1
Caelo	Pansy herb, cut	12189204-3463312101	1
Caelo	Pansy herb, cut	17101205	1
Caelo	Pansy herb, cut	13091205	1
Caelo	Pansy herb, cut	10291007	1
Caelo	Pansy herb, cut	12189203	3
Caelo	Pansy herb, cut	10291008	1
Caelo	Pansy herb, cut	10291009	4
Caelo	Pansy herb, cut	11216103	2
Caelo	Pansy herb, cut	12189203	6
Caelo	Pansy herb, cut	12189204	9
Caelo	Pansy herb, cut	12189204	4
Caelo	Pansy herb, cut	12382806	1
Caelo	Pansy herb, cut	7101303	1
Caelo	Pansy herb, cut	14061311	1
Caelo	Pansy herb, cut	15021301	1
Caelo	Parsley herb, rubbed	12376601	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Parsley herb, rubbed	51978126	1
Caelo	Parsley herb, rubbed	12376602	3
Caelo	Parsley herb, rubbed	12376603	1
Caelo	Parsley root, cut	6441A120606	1
Caelo	Parsley root, cut	13029403	1
Caelo	Parsley root, cut	11038704	1
Caelo	Passionflower herb, cut	12031704	1
Caelo	Passionflower herb, cut	12031707	1
Caelo	Passionflower herb, cut	12031705	5
Caelo	Passionflower herb, cut	12031713	1
Caelo	Passionflower herb, cut	12031715	8
Caelo	Passionflower herb, cut	12031703	2
Caelo	Passionflower herb, cut	12031712	1
Caelo	Passionflower herb, cut	13141205	5
Caelo	Passionflower herb, cut	2913A-01669	1
Caelo	Passionflower herb, cut	12031717	5
Caelo	Passionflower herb, cut	15085105	1
Caelo	Passionflower herb, cut	13141203	2
Caelo	Passionflower herb, cut	13141202	6
Caelo	Passionflower herb, cut	12101301	1
Caelo	Passionflower herb, cut	12031710	13
Caelo	Passionflower herb, cut	12031716	3
Caelo	Passionflower herb, cut	11049108	2
Caelo	Passionflower herb, cut	11049115	1
Caelo	Passionflower herb, cut	11049114	1
Caelo	Passionflower herb, cut	11049113	1
Caelo	Passionflower herb, cut	11049111	1
Caelo	Passionflower herb, cut	12031714	2
Caelo	Passionflower herb, cut	1011A-01669	1
Caelo	Passionflower herb, cut	11049116	3
Caelo	Passionflower herb, cut	12031702	2
Caelo	Peppermint leaves, cut	12266903	6
Caelo	Peppermint leaves, cut	12054149	1
Caelo	Peppermint leaves, cut	ChB:311092	1
Caelo	Peppermint leaves, cut	11347609	1
Caelo	Peppermint leaves, cut	912E-01505	1
Caelo	Peppermint leaves, cut	12266904	3
Caelo	Peppermint leaves, cut	12266908	7
Caelo	Peppermint leaves, cut	12266912	1
Caelo	Peppermint leaves, cut	20111215	1
Caelo	Peppermint leaves, cut	8101301	1
Caelo	Peppermint leaves, cut	11294401	3
Caelo	Peppermint leaves, cut	11327803	7
Caelo	Peppermint leaves, cut	13214707	1
Caelo	Peppermint leaves, cut	11327808	5
Caelo	Peppermint leaves, cut	11327802	1
Caelo	Peppermint leaves, cut	Int.Ch.:313011	1
Caelo	Peppermint leaves, cut	11327801	2
Caelo	Peppermint leaves, cut	11294409	2
Caelo	Peppermint leaves, cut	1132803	1
Caelo	Peppermint leaves, cut	11294405	1
Caelo	Peppermint leaves, cut	13214706	1
Caelo	Peppermint leaves, cut	12266913	9
Caelo	Peppermint leaves, cut	13030804	1
Caelo	Peppermint leaves, cut	268320	1
Caelo	Peppermint leaves, cut	13030807	3
Caelo	Peppermint leaves, cut	14221701	1
Caelo	Peppermint leaves, cut	13214705	1
Caelo	Peppermint leaves, cut	13030808	1
Caelo	Peppermint leaves, cut	13105001	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Peppermint leaves, cut	4912E-01503	1
Caelo	Peppermint leaves, cut	2181A1209-13	1
Caelo	Peppermint leaves, cut	20061202	1
Caelo	Peppermint leaves, cut	2181B090928	1
Caelo	Peppermint leaves, cut	6011403	1
Caelo	Peppermint leaves, cut	12032311	1
Caelo	Peppermint leaves, cut	Nachprüfung	1
Caelo	Peppermint leaves, cut	313A-01503	1
Caelo	Peppermint leaves, cut	12032319	2
Caelo	Peppermint leaves, cut	13030805	6
Caelo	Peppermint leaves, cut	13030808-3401310161	1
Caelo	Peppermint leaves, cut	5091307	1
Caelo	Peppermint leaves, cut	12266908-343431160	1
Caelo	Peppermint leaves, cut	13030806	1
Caelo	Peppermint leaves, cut	276514	4
Caelo	Peppermint leaves, cut	2181B140205	1
Caelo	Phenobarbital	12D30-N02	1
Caelo	Phenol	12223020	1
Caelo	Phenol	12223001	1
Caelo	Phenol	11163809	1
Caelo	Phenol	11163801	1
Caelo	Phenol	7061305	1
Caelo	Phenol	12223022	1
Caelo	Phenol	13296902	1
Caelo	Phenol	12223005	1
Caelo	Pimpernell root	12027405	2
Caelo	Pimpernell root	12027410	1
Caelo	Pimpernell root	12027411	1
Caelo	Plantain herb, cut	123741004	1
Caelo	Plantain herb, cut	10349614	1
Caelo	Plantain herb, cut	10349610	2
Caelo	Plantain herb, cut	9311208	1
Caelo	Plantain herb, cut	10349603	2
Caelo	Plantain herb, cut	12374101	4
Caelo	Plantain herb, cut	10349605	2
Caelo	Plantain herb, cut	14125907	1
Caelo	Plantain herb, cut	13232404	1
Caelo	Plantain herb, cut	13232401	2
Caelo	Plantain herb, cut	12374106	1
Caelo	Plantain leaves, cut	10315711	5
Caelo	Plantain leaves, cut	4021411	1
Caelo	Plantain leaves, cut	10315705	1
Caelo	Plantain leaves, cut	6111209	1
Caelo	Plantain leaves, cut	8061208	1
Caelo	Plantain leaves, cut	19121202	1
Caelo	Plantain leaves, cut	20111208	1
Caelo	Plantain leaves, cut	20111304	1
Caelo	Plantain leaves, cut	12362902	4
Caelo	Plantain leaves, cut	23121304	1
Caelo	Plantain leaves, cut	4271A100615G	1
Caelo	Plantain leaves, cut	25021303	1
Caelo	Plantain leaves, cut	13113004-3488312172	1
Caelo	Plantain leaves, cut	10315715	9
Caelo	Plantain leaves, cut	17071201	1
Caelo	Plantain leaves, cut	15096301	1
Caelo	Plantain leaves, cut	14199202	1
Caelo	Plantain leaves, cut	13410603	4
Caelo	Plantain leaves, cut	13232401	1
Caelo	Plantain leaves, cut	1313007	1
Caelo	Plantain leaves, cut	10315714	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Plantain leaves, cut	10328702	2
Caelo	Plantain leaves, cut	12225802	6
Caelo	Plantain leaves, cut	12362901	2
Caelo	Plantain leaves, cut	15111302	1
Caelo	Plantain leaves, cut	1213E-03556	1
Caelo	Plantain leaves, cut	13113008	2
Caelo	Plantain leaves, cut	13113007	9
Caelo	Plantain leaves, cut	13113006	5
Caelo	Plantain leaves, cut	13113005	2
Caelo	Plantain leaves, cut	12362906	6
Caelo	Plantain leaves, cut	15101204	1
Caelo	Plantain leaves, cut	12225804	1
Caelo	Plantain leaves, cut	12225803	3
Caelo	Plantain leaves, cut	12362903	36
Caelo	Plantain leaves, cut	12225801	1
Caelo	Plantain leaves, cut	31051316	1
Caelo	Plantain leaves, cut	13113010	3
Caelo	Plantain leaves, cut	13113004	16
Caelo	Plantain leaves, cut	13113001	7
Caelo	Podophyllum resin (fr...	12287810	1
Caelo	Podophyllum resin (fr...	11085807	6
Caelo	Podophyllum resin (fr...	11085803	1
Caelo	Podophyllum resin (fr...	11085811	1
Caelo	Podophyllum resin (fr...	82433349	1
Caelo	Podophyllum resin (fr...	12287805	1
Caelo	Podophyllum resin (fr...	12379903	1
Caelo	Poplar buds	nachprüfung	1
Caelo	Poplar buds	70864257	1
Caelo	Poplar buds	12027506	1
Caelo	Poplar buds	12027504	1
Caelo	Potassium hydrocarbon...	11105804	2
Caelo	Potassium hydrocarbon...	1011M-01728	1
Caelo	Potassium hydrocarbon...	12141919	3
Caelo	Potassium hydrocarbon...	11105801	1
Caelo	Potassium hydrocarbon...	11105812	2
Caelo	Potassium hydrocarbon...	8101202	1
Caelo	Potassium hydrocarbon...	12239701	5
Caelo	Potassium hydrocarbon...	10052610	1
Caelo	Potassium hydrocarbon...	10052629	1
Caelo	Potassium hydrocarbon...	6011405	1
Caelo	Potassium hydrocarbon...	12239703	8
Caelo	Potassium hydrocarbon...	12239705	1
Caelo	Potassium hydrocarbon...	13141926	1
Caelo	Potassium hydrocarbon...	13390303	1
Caelo	Potassium hydrocarbon...	20080410-3	1
Caelo	Potassium hydrocarbon...	24051301	1
Caelo	Potassium hydrocarbon...	33131-01728	1
Caelo	Potassium hydrocarbon...	3812Q-01728	1
Caelo	Potassium hydrocarbon...	700544	1
Caelo	Potassium hydrocarbon...	IntCh:217002	1
Caelo	Potassium hydrocarbon...	12239702	2
Caelo	Potassium hydrocarbon...	11105808	1
Caelo	Potassium hydrocarbon...	11105818	2
Caelo	Potassium hydrocarbon...	11105822	1
Caelo	Potassium hydrocarbon...	1214190	1
Caelo	Potassium hydrocarbon...	12141905	3
Caelo	Potassium hydrocarbon...	12141910	13
Caelo	Potassium hydrocarbon...	12230703	1
Caelo	Potassium hydrocarbon...	12141930	2
Caelo	Potassium hydrocarbon...	12141924	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Potassium hydrocarbon. ...	12141920	1
Caelo	Potassium hydrocarbon. ...	12141912	3
Caelo	Potassium hydroxide	12057906	1
Caelo	Potassium hydroxide	13275201	1
Caelo	Potassium hydroxide	12057903	1
Caelo	Potassium hydroxide	17091202	1
Caelo	Potassium hydroxide	13275207	1
Caelo	Potassium hydroxide	27111310	1
Caelo	Potassium hydroxide	12382611	2
Caelo	Potassium hydroxide	11165705	1
Caelo	Potassium hydroxide	12057905	2
Caelo	Potassium hydroxide	12057912	2
Caelo	Potassium hydroxide	12382601	2
Caelo	Potassium hydroxide	12382603	5
Caelo	Potassium hydroxide	12382606	2
Caelo	Potassium hydroxide	12057908	2
Caelo	Primrose flower	11206811	1
Caelo	Primrose flower	11374403	1
Caelo	Primrose flower	11374404	1
Caelo	Primrose flower	113744044	1
Caelo	Primrose flower	13086602	2
Caelo	Primrose flower	13086603	2
Caelo	Primrose flower	13086603	3
Caelo	Primrose flower	13276904	1
Caelo	Primrose flower	10207104	1
Caelo	Primrose flower	11206603	1
Caelo	Primrose flower	11206811	3
Caelo	Primrose flower	11268005	2
Caelo	Primrose flower	11374402	1
Caelo	Primrose flower	13086605	1
Caelo	Primrose flower	5021303	1
Caelo	Primrose flower	9021301	1
Caelo	Primrose flower	10072509	1
Caelo	Primrose flower	11206804	1
Caelo	Primrose flower	11206805	1
Caelo	Primrose flower	11206807	1
Caelo	Primrose flower	11206808	2
Caelo	Primrose flower	11206810	7
Caelo	Primrose flower	11206803	5
Caelo	Primrose flower	11374401	12
Caelo	Primrose flower	13086608	1
Caelo	Primrose root, cut	4021410	1
Caelo	Primrose root, cut	24011301	1
Caelo	Primrose root, cut	13087002	7
Caelo	Primrose root, cut	12064502	1
Caelo	Primrose root, cut	13087004	1
Caelo	Primrose root, cut	10382012	1
Caelo	Primrose root, cut	5010E-02159	1
Caelo	Primrose root, cut	10382009	2
Caelo	Primrose root, cut	13087005-3534411072	1
Caelo	Primrose root, cut	10382010	1
Caelo	Primrose root, cut	Int.Ch:318090	1
Caelo	Primrose root, cut	71653517	1
Caelo	Primrose root, cut	12064503	1
Caelo	Primrose root, cut	10382013	2
Caelo	Primrose root, cut	13087005	3
Caelo	Primrose root, cut	212Q-02159	1
Caelo	Primrose root, cut	13087001	1
Caelo	Primrose root, cut	13067001	1
Caelo	Primrose root, cut	12064506	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Propolis dry extract ...	11124101	1
Caelo	Pumpkin seeds, peeled	12249011	2
Caelo	Pumpkin seeds, peeled	12249001	2
Caelo	Pumpkin seeds, peeled	140736306	1
Caelo	Pumpkin seeds, peeled	14073603	1
Caelo	Pumpkin seeds, peeled	122490911	1
Caelo	Ramsons herb, cut	11182205	1
Caelo	Ramsons herb, cut	11182203	1
Caelo	Ramsons herb, cut	11182204	1
Caelo	Ramsons herb, cut	12380802	2
Caelo	Ramsons herb, cut	12380801	2
Caelo	Ramsons herb, cut	12380803	2
Caelo	Ramsons herb, cut	3511B111005	2
Caelo	Raspberry leaves, cut	12368706	1
Caelo	Raspberry leaves, cut	1236705	1
Caelo	Raspberry leaves, cut	12362709	5
Caelo	Raspberry leaves, cut	12362707	4
Caelo	Raspberry leaves, cut	12362703	7
Caelo	Raspberry leaves, cut	12362701	7
Caelo	Raspberry leaves, cut	10013409	2
Caelo	Raspberry leaves, cut	613M-01511	1
Caelo	Raspberry leaves, cut	314U1511	1
Caelo	Raspberry leaves, cut	12392709	1
Caelo	Raspberry leaves, cut	14018803	1
Caelo	Raspberry leaves, cut	13086704	1
Caelo	Raspberry leaves, cut	12130107	1
Caelo	Raspberry leaves, cut	1210315	1
Caelo	Raspberry leaves, cut	12103108	9
Caelo	Raspberry leaves, cut	12103102	2
Caelo	Raspberry leaves, cut	11121201	1
Caelo	Raspberry leaves, cut	17121203	1
Caelo	Raspberry leaves, cut	25091201	1
Caelo	Raspberry leaves, cut	12362711	9
Caelo	Raspberry leaves, cut	22081201	1
Caelo	Raspberry leaves, cut	12103105	16
Caelo	Raspberry leaves, cut	21051302	1
Caelo	Raspberry leaves, cut	20081311	1
Caelo	Raspberry leaves, cut	18101203	1
Caelo	Raspberry leaves, cut	18041304	1
Caelo	Raspberry leaves, cut	11071301	1
Caelo	Raspberry leaves, cut	23051204	1
Caelo	Raspberry leaves, cut	30011408	1
Caelo	Raspberry leaves, cut	10013407	1
Caelo	Raspberry leaves, cut	10013406	4
Caelo	Raspberry leaves, cut	4071202	1
Caelo	Raspberry leaves, cut	307211511	1
Caelo	Raspberry leaves, cut	IntCh:311090	1
Caelo	Raspberry leaves, cut	2405211511	1
Caelo	Raspberry leaves, cut	10013410	1
Caelo	Raspberry leaves, cut	9101204	1
Caelo	Raspberry leaves, cut	9081205	1
Caelo	Raspberry leaves, cut	9011404	1
Caelo	Raspberry leaves, cut	8031307	1
Caelo	Raspberry leaves, cut	713E-01511	1
Caelo	Raspberry leaves, cut	7011402	1
Caelo	Raspberry leaves, cut	6859427	1
Caelo	Raspberry leaves, cut	13101603	5
Caelo	Raspberry leaves, cut	12362705	10
Caelo	Raspberry leaves, cut	12362704	2
Caelo	Raspberry leaves, cut	2909211511	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Raspberry leaves, cut	12362702	8
Caelo	Raspberry leaves, cut	12103111	21
Caelo	Raspberry leaves, cut	12103107	12
Caelo	Raspberry leaves, cut	10136404	1
Caelo	Raspberry leaves, cut	10136412	1
Caelo	Raspberry leaves, cut	11030704	2
Caelo	Raspberry leaves, cut	13038003	3
Caelo	Raspberry leaves, cut	11030706	4
Caelo	Raspberry leaves, cut	11030707	3
Caelo	Raspberry leaves, cut	13101605	1
Caelo	Raspberry leaves, cut	12362710-3432311160	1
Caelo	Raspberry leaves, cut	11030705	1
Caelo	Raspberry leaves, cut	1310603	1
Caelo	Raspberry leaves, cut	13038002	1
Caelo	Raspberry leaves, cut	13127901	3
Caelo	Raspberry leaves, cut	12362706	32
Caelo	Raspberry leaves, cut	12362710	10
Caelo	Raspberry leaves, cut	261490	1
Caelo	Raspberry leaves, cut	13101602-347312141	1
Caelo	Raspberry leaves, cut	2271C120508	4
Caelo	Redwood	12041403	1
Caelo	Redwood	13106901	1
Caelo	Redwood	12049607	2
Caelo	Redwood	12049608	2
Caelo	Restharrow root, cut	1233001	1
Caelo	Restharrow root, cut	15101313	1
Caelo	Restharrow root, cut	20111213	1
Caelo	Restharrow root, cut	21011306	1
Caelo	Restharrow root, cut	71035467	1
Caelo	Restharrow root, cut	72439069	1
Caelo	Restharrow root, cut	Int.Ch:212150	1
Caelo	Restharrow root, cut	12330005	5
Caelo	Restharrow root, cut	4021406	1
Caelo	Restharrow root, cut	6101201	1
Caelo	Restharrow root, cut	11103105	2
Caelo	Restharrow root, cut	11103107	1
Caelo	Restharrow root, cut	1230004	1
Caelo	Restharrow root, cut	12330001	12
Caelo	Restharrow root, cut	12330002	1
Caelo	Restharrow root, cut	12330003	2
Caelo	Restharrow root, cut	11247302	2
Caelo	Rhubarb root, cut	11057812	1
Caelo	Rhubarb root, cut	4612A-02187	1
Caelo	Rhubarb root, cut	12211902	4
Caelo	Rhubarb root, cut	13235201	2
Caelo	Rhubarb root, cut	12211910	1
Caelo	Rhubarb root, cut	12211906	1
Caelo	Rhubarb root, cut	12211904	2
Caelo	Rhubarb root, cut	12211903	3
Caelo	Rhubarb root, cut	11057809	1
Caelo	Rhubarb root, cut	11321806	1
Caelo	Rhubarb root, cut	11057818	3
Caelo	Rhubarb root, cut	11057815	1
Caelo	Rhubarb root, cut	11057810	2
Caelo	Rhubarb root, cut	11265902	1
Caelo	Rhubarb root, cut	13235203	2
Caelo	Rhubarb root, cut	10071302	1
Caelo	Rhubarb root, cut	11057804	1
Caelo	Rhubarb root, cut	12211901	1
Caelo	Rhubarb root, cut	25111305	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Rhubarb root, cut	13235205	1
Caelo	Rhubarb root, cut	14155404	1
Caelo	Rhubarb root, cut	11057811	1
Caelo	Rhubarb root, cut	1811a-02187	1
Caelo	Rhubarb root, cut	15101301	1
Caelo	Rhubarb root, powdered	11043818	1
Caelo	Rhubarb root, powdered	11043825	2
Caelo	Rhubarb root, powdered	11043826	1
Caelo	Rhubarb root, powdered	11043816	1
Caelo	Rhubarb root, powdered	9071201	1
Caelo	Rhubarb root, powdered	11043809	1
Caelo	Rhubarb root, powdered	11043816	2
Caelo	Rhubarb root, powdered	11043822	1
Caelo	Rhubarb root, powdered	11043817	1
Caelo	Rhubarb root, powdered	11043819	2
Caelo	Rhubarb root, powdered	11043818	1
Caelo	Rhubarb root, powdered	23061402	1
Caelo	Rhubarb root, powdered	13193109	1
Caelo	Rhubarb root, powdered	13193106	2
Caelo	Rhubarb root, powdered	13193104	4
Caelo	Rose flower	12380008	2
Caelo	Rose flower	12380004	1
Caelo	Rose flower	13126304	1
Caelo	Rose flower leaves, cut	11304904	5
Caelo	Rose flower leaves, cut	11304908	1
Caelo	Rose flower leaves, cut	11304910	1
Caelo	Rose flower leaves, cut	11304912	2
Caelo	Rose flower leaves, cut	12380001	5
Caelo	Rose flower leaves, cut	12380004	2
Caelo	Rose flower leaves, cut	12380008	1
Caelo	Rose flower leaves, cut	11304901	3
Caelo	Rose flower leaves, cut	13194402	1
Caelo	Rose flower leaves, cut	12380007-3357319071	1
Caelo	Rose flower leaves, cut	13194403	4
Caelo	Rose flower leaves, cut	11304906	2
Caelo	Rose flower leaves, cut	11011301	1
Caelo	Rose flower leaves, cut	10306514	1
Caelo	Rose flower leaves, cut	1319002	1
Caelo	Rose flower leaves, cut	10113211	1
Caelo	Rosehip	12064213	1
Caelo	Rosehip	13048701	2
Caelo	Rosehip	13048703	1
Caelo	Rosehip	13048704	3
Caelo	Rosehip	16111201	1
Caelo	Rosehip	19111204	1
Caelo	Rosehip	nachprüfung	2
Caelo	Rosehip	12064212	2
Caelo	Rosehip	13048703	1
Caelo	Rosehip	12064213	1
Caelo	Rosehip	12064207	1
Caelo	Rosehip	12064206	1
Caelo	Rosehip	12064202	2
Caelo	Rosehip	12029008	1
Caelo	Rosehip	114Q-01542	1
Caelo	Rosehip	12064212	2
Caelo	Rosehip	12064207	3
Caelo	Rosehip	13048704	2
Caelo	Rosehip	12064210	3
Caelo	Rosehip	12064209	3
Caelo	Rosehip	12064206	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Rosehip	12064202	2
Caelo	Rosehip	12064201	1
Caelo	Rosehip	1512211542	1
Caelo	Rosehip	2103311542	1
Caelo	Rosehip	2402211542	1
Caelo	Rosehip	307211542	1
Caelo	Rosehip peel, cut	2851A120904konv.	1
Caelo	Rosehip peel, cut	14050705	1
Caelo	Rosehip peel, cut	14050704	1
Caelo	Rosehip peel, cut	13317805	1
Caelo	Rosehip peel, cut	9121301	1
Caelo	Rosehip peel, cut	7031305	1
Caelo	Rosehip peel, cut	5091301	1
Caelo	Rosehip peel, cut	1021305	1
Caelo	Rosehip peel, cut	15061210	1
Caelo	Rosehip peel, cut	10157312	2
Caelo	Rosehip peel, cut	12357505	7
Caelo	Rosehip peel, cut	12288302	4
Caelo	Rosehip peel, cut	10101206	1
Caelo	Rosehip peel, cut	13317801	1
Caelo	Rosehip peel, cut	12357504	2
Caelo	Rosehip peel, cut	12357502	2
Caelo	Rosehip peel, cut	12288301	1
Caelo	Rosehip peel, cut	11301403	3
Caelo	Rosehip peel, cut	11301404	1
Caelo	Rosehip peel, cut	11301407	7
Caelo	Rosehip peel, cut	12064207	1
Caelo	Rosemary leaves, cut	10139811	1
Caelo	Rosemary leaves, cut	28051404	1
Caelo	Rosemary leaves, cut	15125008	1
Caelo	Rosemary leaves, cut	15125001	3
Caelo	Rosemary leaves, cut	1415901	1
Caelo	Rosemary leaves, cut	14082901	1
Caelo	Rosemary leaves, cut	13128806	2
Caelo	Rosemary leaves, cut	11193406	1
Caelo	Rosemary leaves, cut	11193405	1
Caelo	Rosemary leaves, cut	IntCh:313060	1
Caelo	Rosemary leaves, cut	1812A-01510	1
Caelo	Rosemary leaves, cut	14082902	1
Caelo	Rosemary leaves, cut	13128805	1
Caelo	Rosemary leaves, cut	13128802	2
Caelo	Rosemary leaves, cut	13128801	1
Caelo	Rosemary leaves, cut	11193405	3
Caelo	Rosemary leaves, cut	11193407	1
Caelo	Rosemary leaves, cut	11193404	2
Caelo	Rosemary leaves, cut	11193402	3
Caelo	Rosemary leaves, cut	11193403	1
Caelo	Rosemary leaves, cut	5041302	1
Caelo	Rosemary leaves, cut	11193408	5
Caelo	Rosemary leaves, cut	11192408	1
Caelo	Round leaf buchu leaves	13056605	1
Caelo	Round leaf buchu leaves	13056601	2
Caelo	Round leaf buchu leaves	13056602	2
Caelo	Rue herb, cut	12148806	1
Caelo	Rue herb, cut	12148803	2
Caelo	Rue herb, cut		1
Caelo	Rue herb, cut	12148804	1
Caelo	Rue herb, cut	9336802	1
Caelo	Rue herb, cut	11371803	1
Caelo	Rue herb, cut	12148801	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Saffron strands	10184811	2
Caelo	Saffron strands	10184822	1
Caelo	Saffron strands	11071310	1
Caelo	Saffron strands	12108308	2
Caelo	Saffron strands	12108311	2
Caelo	Saffron strands	15101305	1
Caelo	Saffron strands	21011403	1
Caelo	Sage leaves, cut	12370014	7
Caelo	Sage leaves, cut	11347510	1
Caelo	Sage leaves, cut	11347513	2
Caelo	Sage leaves, cut	12370006	3
Caelo	Sage leaves, cut	12370004	2
Caelo	Sage leaves, cut	12370003	7
Caelo	Sage leaves, cut	12370013	4
Caelo	Sage leaves, cut	12370001	18
Caelo	Sage leaves, cut	12112101	1
Caelo	Sage leaves, cut	1209211513	1
Caelo	Sage leaves, cut	12021302	1
Caelo	Sage leaves, cut	15041304	1
Caelo	Sage leaves, cut	12370015	2
Caelo	Sage leaves, cut	13266626	1
Caelo	Sage leaves, cut	12370003-3359319071	1
Caelo	Sage leaves, cut	12370009	9
Caelo	Sage leaves, cut	12370011	11
Caelo	Sage leaves, cut	12370014-3477312161	1
Caelo	Sage leaves, cut	12370014-3541411092	1
Caelo	Sage leaves, cut	13266605	2
Caelo	Sage leaves, cut	123770010	1
Caelo	Sage leaves, cut	23101203	1
Caelo	Sage leaves, cut	12380009	1
Caelo	Sage leaves, cut	13011405	1
Caelo	Sage leaves, cut	13266603	2
Caelo	Sage leaves, cut	14111315	1
Caelo	Sage leaves, cut	11347509	7
Caelo	Sage leaves, cut	31051315	1
Caelo	Sage leaves, cut	31081202	1
Caelo	Sage leaves, cut	22061201	1
Caelo	Sage leaves, cut	312010	1
Caelo	Sage leaves, cut	11347512	1
Caelo	Sage leaves, cut	1237003	1
Caelo	Sage leaves, cut	20121201	1
Caelo	Sage leaves, cut	22081203	1
Caelo	Sage leaves, cut	24091204	1
Caelo	Sage leaves, cut	25061302	1
Caelo	Sage leaves, cut	2301C130326	1
Caelo	Sage leaves, cut	26081301	1
Caelo	Sage leaves, cut	2301A140205	1
Caelo	Sage leaves, cut	2301A110420	3
Caelo	Sage leaves, cut	22111203	1
Caelo	Sage leaves, cut	19071205	1
Caelo	Sage leaves, cut	9121302	1
Caelo	Sage leaves, cut	15121201	1
Caelo	Sage leaves, cut	11056123	6
Caelo	Sage leaves, cut	11056124	1
Caelo	Sage leaves, cut	11056125	3
Caelo	Sage leaves, cut	111012004	1
Caelo	Sage leaves, cut	11347503	1
Caelo	Sage leaves, cut	11347508	8
Caelo	Sage leaves, cut	8011420	1
Caelo	Sage leaves, cut	17061302	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sage leaves, cut	1104211513	1
Caelo	Sage leaves, cut	11056104	1
Caelo	Sage leaves, cut	11056108	2
Caelo	Sage leaves, cut	1513E-01513	1
Caelo	Sage leaves, cut	103311513	1
Caelo	Sage leaves, cut	410211513	1
Caelo	Sarsaparilla, cut	13079201	1
Caelo	Savory mountain type,...	12177208	2
Caelo	Savory mountain type,...	12200801	1
Caelo	Savory mountain type,...	12177207	1
Caelo	Savory mountain type,...	12177203	7
Caelo	Savory mountain type,...	12177201	1
Caelo	Savory mountain type,...	13172404	2
Caelo	Seaweed, cut	280172	4
Caelo	Seaweed, cut	11351109	1
Caelo	Seaweed, cut	11352209	1
Caelo	Seaweed, cut	1313E-01558	1
Caelo	Seaweed, cut	14071502	1
Caelo	Seaweed, cut	11351111	1
Caelo	Senna leaves, cut	11277301	1
Caelo	Senna leaves, cut	12273115	9
Caelo	Senna leaves, cut	12273106	3
Caelo	Senna leaves, cut	12273120	1
Caelo	Senna leaves, cut	12276111	1
Caelo	Senna leaves, cut	12273118	6
Caelo	Senna leaves, cut	12273104	1
Caelo	Senna leaves, cut	12273107	8
Caelo	Senna leaves, cut	12115503	7
Caelo	Senna leaves, cut	12115502	1
Caelo	Senna leaves, cut	12115501	4
Caelo	Senna leaves, cut	11277312	1
Caelo	Senna leaves, cut	12273113	3
Caelo	Senna leaves, cut	12273101	6
Caelo	Senna leaves, cut	18071201	1
Caelo	Senna leaves, cut	11277316	5
Caelo	Senna leaves, cut	11277307	1
Caelo	Senna leaves, cut	11277304	5
Caelo	Senna leaves, cut	806211514	1
Caelo	Senna leaves, cut	12273105	7
Caelo	Senna leaves, cut	103311514	2
Caelo	Senna leaves, cut	12273119	4
Caelo	Senna leaves, cut	11041009	1
Caelo	Senna leaves, cut	10126502	1
Caelo	Senna leaves, cut	9071302	1
Caelo	Senna leaves, cut	711211514	1
Caelo	Senna leaves, cut	514R1514	1
Caelo	Senna leaves, cut	5091306	1
Caelo	Senna leaves, cut	1273103	1
Caelo	Senna leaves, cut	3813E1514	1
Caelo	Senna leaves, cut	3212E-01514	1
Caelo	Senna leaves, cut	313082	1
Caelo	Senna leaves, cut	2909211514	1
Caelo	Senna leaves, cut	2413Q01514	1
Caelo	Senna leaves, cut	2231B13014	1
Caelo	Senna leaves, cut	4113Q1514	1
Caelo	Senna leaves, cut	13136705-3489312103	1
Caelo	Senna leaves, cut	13136704	15
Caelo	Senna leaves, cut	12273116	15
Caelo	Senna leaves, cut	12273114	2
Caelo	Senna leaves, cut	12273111	8

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Senna leaves, cut	5013U01514	1
Caelo	Senna leaves, cut	21011401	1
Caelo	Senna leaves, cut	13136724	2
Caelo	Senna leaves, cut	13136718	1
Caelo	Senna leaves, cut	13136709	1
Caelo	Senna leaves, cut	13136705	2
Caelo	Senna leaves, cut	13136703	3
Caelo	Senna leaves, cut	131316701	1
Caelo	Senna leaves, cut	1316703	2
Caelo	Senna leaves, cut	1803311514	1
Caelo	Senna leaves, cut	15101303	1
Caelo	Senna leaves, cut	14306324	1
Caelo	Senna leaves, cut	14306311	2
Caelo	Senna leaves, cut	14306310	1
Caelo	Senna leaves, powdered	14088703	1
Caelo	Senna leaves, powdered	11193307	1
Caelo	Shepherd's purse herb...	12354206	4
Caelo	Shepherd's purse herb...	12354205	6
Caelo	Shepherd's purse herb...	12354209	1
Caelo	Shepherd's purse herb...	12354503	1
Caelo	Shepherd's purse herb...	4411E-01625	1
Caelo	Shepherd's purse herb...	13344203	1
Caelo	Shepherd's purse herb...	14061201	1
Caelo	Shepherd's purse herb...	15101202	1
Caelo	Shepherd's purse herb...	11036401	1
Caelo	Shepherd's purse herb...	3121301	1
Caelo	Shepherd's purse herb...	12354204	18
Caelo	Shepherd's purse herb...	11328205	2
Caelo	Shepherd's purse herb...	11328204	3
Caelo	Shepherd's purse herb...	11328206	2
Caelo	Shepherd's purse herb...	11328202	1
Caelo	Shepherd's purse herb...	1132820111-14	1
Caelo	Shepherd's purse herb...	11091202	1
Caelo	Shepherd's purse herb...	10061301	1
Caelo	Shepherd's purse herb...	11328209	6
Caelo	Shepherd's purse herb...	12254202	1
Caelo	Shepherd's purse herb...	12354202	2
Caelo	Shepherd's purse herb...	11036406	8
Caelo	Shepherd's purse herb...	11328208	6
Caelo	Shepherd's purse herb...	11328207	10
Caelo	Shepherd's purse herb...	11036404	2
Caelo	Shepherd's purse herb...	12354207	2
Caelo	Shepherd's purse herb...	12354203-3396310111	1
Caelo	Shepherd's purse herb...	12354201	14
Caelo	Shepherd's purse herb...	11328201	8
Caelo	Shepherd's purse herb...	11328203	7
Caelo	Shepherd's purse herb...	12354203	10
Caelo	Siberien ginseng root...	12326707	1
Caelo	Siberien ginseng root...	10381814	2
Caelo	Siberien ginseng root...	10381817	2
Caelo	Siberien ginseng root...	12326701	2
Caelo	Siberien ginseng root...	12326703	1
Caelo	Siberien ginseng root...	10381818	2
Caelo	Siberien ginseng root...	10381808	1
Caelo	Siberien ginseng root...	10381812	2
Caelo	Silverweed, cut	9362606	1
Caelo	Silverweed, cut	11328104	1
Caelo	Silverweed, cut	11328103	5
Caelo	Silverweed, cut	11326102	1
Caelo	Silverweed, cut	9362614	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Silverweed, cut	11016405	1
Caelo	Silverweed, cut	8111204	1
Caelo	Silverweed, cut	11328105	7
Caelo	Silverweed, cut	11016401	1
Caelo	Silverweed, cut	20081202	1
Caelo	Silverweed, cut	11016404	1
Caelo	Silverweed, cut	5012E-01619	1
Caelo	Silverweed, cut	13410801	1
Caelo	Silverweed, cut	11328112	1
Caelo	Silverweed, cut	11016404	1
Caelo	Silverweed, cut	11016407	2
Caelo	Silverweed, cut	11016409	3
Caelo	Silverweed, cut	11328109	15
Caelo	Silverweed, cut	11328110	1
Caelo	Sodium carbonate deca...	11254706	1
Caelo	Sodium carbonate deca...	11254708	2
Caelo	Sodium carbonate deca...	80136428	1
Caelo	Sodium carbonate deca...	80136179	1
Caelo	Sodium carbonate deca...	13036910	1
Caelo	Sodium carbonate deca...	13036909	1
Caelo	Sodium carbonate deca...	13036907	1
Caelo	Sodium carbonate deca...	12239806	1
Caelo	Sodium carbonate deca...	12239810	3
Caelo	Sodium carbonate deca...	13036902	2
Caelo	Sodium dihydrogen pho...	15122808	1
Caelo	Sodium dihydrogen pho...	13D08-N25	1
Caelo	Sodium dihydrogen pho...	12198517	3
Caelo	Sodium dihydrogen pho...	12198510	2
Caelo	Sodium dihydrogen pho...	12198506	1
Caelo	Sodium dihydrogen pho...	11277504	1
Caelo	Sodium hydrogen carbo...	13234005	4
Caelo	Sodium hydrogen carbo...	13234004	2
Caelo	Sodium hydrogen carbo...	11304809	2
Caelo	Sodium hydrogen carbo...	130701701	1
Caelo	Sodium hydrogen carbo...	1307017-02	1
Caelo	Sodium hydrogen carbo...	13186704	1
Caelo	Sodium hydrogen carbo...	13186706	1
Caelo	Sodium hydrogen carbo...	13186721	1
Caelo	Sodium hydrogen carbo...	13234007	4
Caelo	Sodium hydrogen carbo...	3313I-01892	1
Caelo	Sodium hydrogen carbo...	3012Q-01892	1
Caelo	Sodium hydrogen carbo...	21081204	1
Caelo	Sodium hydrogen carbo...	11304802	3
Caelo	Sodium hydrogen carbo...	15328602	1
Caelo	Sodium hydrogen carbo...	13390505	1
Caelo	Sodium hydrogen carbo...	13234205	1
Caelo	Sodium hydrogen carbo...	13234202	3
Caelo	Sodium hydrogen carbo...	12132213	1
Caelo	Sodium hydrogen carbo...	12132219	10
Caelo	Sodium hydrogen carbo...	12132204	11
Caelo	Sodium hydrogen carbo...	12132203	4
Caelo	Sodium hydrogen carbo...	12109205	6
Caelo	Sodium hydrogen carbo...	1203030-1	1
Caelo	Sodium hydrogen carbo...	13186711	1
Caelo	Sodium hydrogen carbo...	13186705	3
Caelo	Sodium hydrogen carbo...	12132503	1
Caelo	Sodium hydrogen carbo...	1234702	2
Caelo	Sodium hydrogen carbo...	12324725	2
Caelo	Sodium hydrogen carbo...	6011404	1
Caelo	Sodium hydrogen carbo...	8101203	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium hydrogen carbo...	12324708	1
Caelo	Sodium hydrogen carbo...	12324702	7
Caelo	Sodium hydrogen carbo...	1219204	1
Caelo	Sodium hydrogen carbo...	11304813	2
Caelo	Sodium hydrogen carbo...	12356403	1
Caelo	Sodium hydrogen carbo...	13060104	1
Caelo	Sodium hydrogen carbo...	12356407	2
Caelo	Sodium hydrogen carbo...	12324703	1
Caelo	Sodium hydrogen carbo...	13060117	1
Caelo	Sodium hydrogen carbo...	13060120	7
Caelo	Sodium hydrogen carbo...	1307017-01	1
Caelo	Sodium hydrogen carbo...	12356401	4
Caelo	Sodium hydrogen carbo...	13060103	12
Caelo	Sodium hydrogen carbo...	12356303	3
Caelo	Sodium hydrogen carbo...	12109204	6
Caelo	Sodium hydrogen carbo...	12109202	1
Caelo	Sodium hydroxide pell...	12368105	2
Caelo	Sodium hydroxide pell...	11070821	1
Caelo	Sodium hydroxide pell...	15312102	1
Caelo	Sodium monohydrogenph...	11169309	3
Caelo	Sodium monohydrogenph...	11169303	2
Caelo	Sodium monohydrogenph...	9302613	2
Caelo	Sodium monohydrogenph...	12345001	7
Caelo	Sodium monohydrogenph...	9302617	1
Caelo	Sodium monohydrogenph...	11169321	1
Caelo	Sodium monohydrogenph...	12345016	8
Caelo	Sodium monohydrogenph...	12345025	1
Caelo	Sodium monohydrogenph...	28131-01914	1
Caelo	Sodium monohydrogenph...	71199028	1
Caelo	Sodium monohydrogenph...	11169315	4
Caelo	Sodium monohydrogenph...	8300209	1
Caelo	Sodium monohydrogenph...	11169301	1
Caelo	Sodium monohydrogenph...	AKD7	1
Caelo	Sodium monohydrogenph...	83002059	1
Caelo	Sodium monohydrogenph...	12345004	7
Caelo	Sodium monohydrogenph...	12256606	5
Caelo	Sodium monohydrogenph...	12256602	4
Caelo	Sodium monohydrogenph...	12345007	6
Caelo	Sodium monohydrogenph...	1169315	1
Caelo	Sodium monohydrogenph...	12109002	4
Caelo	Sodium monohydrogenph...	72006059	1
Caelo	Sodium monohydrogenph...	12109102	1
Caelo	Sodium monohydrogenph...	12109106	2
Caelo	Sodium monohydrogenph...	12109108	1
Caelo	Sodium monohydrogenph...	12109109	1
Caelo	Sodium monohydrogenph...	13028003	1
Caelo	Sodium monohydrogenph...	11109513	1
Caelo	Sodium monohydrogenph...	12109003	3
Caelo	Sodium monohydrogenph...	12109104	1
Caelo	Sodium monohydrogenph...	13028001	4
Caelo	Sodium monohydrogenph...	10135304	1
Caelo	Sodium monohydrogenph...	12109101	2
Caelo	Sodium sulfate decahy...	12157011	1
Caelo	Sodium sulfate decahy...	12157013	4
Caelo	Sodium sulfate decahy...	12157007	1
Caelo	Sodium sulfate decahy...	12157006	11
Caelo	Sodium sulfate decahy...	12157001	4
Caelo	Sodium sulfate decahy...	11294605	2
Caelo	Sodium sulfate decahy...	11294504	1
Caelo	Sodium sulfate decahy...	11294501	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Sodium sulfate decahy...	11012210	2
Caelo	Sodium sulfate decahy...	12256902	1
Caelo	Sodium sulfate decahy...	12157012	22
Caelo	Sodium sulfate decahy...	12257902	8
Caelo	Sodium sulfate decahy...	2013A-01920	1
Caelo	Sodium sulfate decahy...	205026	1
Caelo	Sodium sulfate decahy...	70706387	1
Caelo	Sodium sulfate decahy...	61599506	1
Caelo	Sodium sulfate decahy...	12157005	20
Caelo	Sodium sulfate decahy...	18101202	1
Caelo	Sodium sulfate decahy...	12257901	11
Caelo	Sodium sulfate decahy...	12157017	1
Caelo	Sodium sulfate decahy...	11012207	1
Caelo	Sodium thiosulfate pe...	26041302	1
Caelo	Sodium thiosulfate pe...	80426288	1
Caelo	Sorrel herbs, cut	11165310	1
Caelo	Sorrel herbs, cut	13289502	1
Caelo	Sorrel herbs, cut	11165302	1
Caelo	Sorrel herbs, cut	130546	1
Caelo	Sour cherry stalks, cut	10367019	1
Caelo	Sour cherry stalks, cut	12042307	1
Caelo	Sour cherry stalks, cut	10367014	1
Caelo	Sour cherry stalks, cut	12042301	1
Caelo	Southernwood root	23071203	1
Caelo	Southernwood root	12163701	1
Caelo	Southernwood root	13033501	1
Caelo	Southernwood root	12144804	1
Caelo	Southernwood root	13130303	1
Caelo	Southernwood root	12232803	1
Caelo	Southernwood root	13130301	5
Caelo	Southernwood root	25111306	1
Caelo	Southernwood root	14347401	1
Caelo	Southernwood root	13130903	1
Caelo	Southernwood root	13130304	1
Caelo	Southernwood root	12163702	2
Caelo	Southernwood, cut	2091305	1
Caelo	Spearmint, cut	12376706	2
Caelo	Spearmint, cut	1512Q-01505	1
Caelo	Spearmint, cut	13105001	12
Caelo	Spearmint, cut	13105003	1
Caelo	Spearmint, cut	12133906	2
Caelo	Spearmint, cut	12133901	3
Caelo	Spearmint, cut	12133909	1
Caelo	Spearmint, cut	11037409+110374	1
Caelo	Speedwell wort, cut	1216504	1
Caelo	Speedwell wort, cut	20111303	1
Caelo	Speedwell wort, cut	14111303	1
Caelo	Speedwell wort, cut	13166701	3
Caelo	Speedwell wort, cut	25091203	1
Caelo	Speedwell wort, cut	4661c111011	1
Caelo	Speedwell wort, cut	12162505	1
Caelo	Speedwell wort, cut	12162504	13
Caelo	Speedwell wort, cut	12162503	3
Caelo	Speedwell wort, cut	11265504	1
Caelo	Speedwell wort, cut	11265503	12
Caelo	Speedwell wort, cut	2513A-01692	1
Caelo	Speedwell wort, cut	28061303	1
Caelo	Speedwell wort, cut	3051306	1
Caelo	Speedwell wort, cut	3091305	1
Caelo	Speedwell wort, cut	11061305	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Speedwell wort, cut	11265502	4
Caelo	St. John's wort, cut	12092202	8
Caelo	St. John's wort, cut	12092204	1
Caelo	St. John's wort, cut	12092203	1
Caelo	St. John's wort, cut	12092201	2
Caelo	St. John's wort, cut	11185607	2
Caelo	St. John's wort, cut	11185605	6
Caelo	St. John's wort, cut	11185602	2
Caelo	St. John's wort, cut	111185608	1
Caelo	St. John's wort, cut	9297304	1
Caelo	St. John's wort, cut	5061208	1
Caelo	St. John's wort, cut	5021301	1
Caelo	St. John's wort, cut	11185608	16
Caelo	St. John's wort, cut	12092209	2
Caelo	St. John's wort, cut	4021B110321	1
Caelo	St. John's wort, cut	4021A100819	2
Caelo	St. John's wort, cut	3213A-01655	1
Caelo	St. John's wort, cut	30011401	1
Caelo	St. John's wort, cut	268913	1
Caelo	St. John's wort, cut	16041301	1
Caelo	St. John's wort, cut	15068105	1
Caelo	St. John's wort, cut	132203204	1
Caelo	St. John's wort, cut	13203205	1
Caelo	St. John's wort, cut	13203204	7
Caelo	St. John's wort, cut	13091303	1
Caelo	Star anise	11314103	2
Caelo	Star anise	12226211	1
Caelo	Star anise	10376405	1
Caelo	Star anise	10169101	1
Caelo	Star anise	11314104	1
Caelo	Star anise	5111206	1
Caelo	Strawberry leaves, cut	4512A-01490	1
Caelo	Strawberry leaves, cut	11117909	1
Caelo	Sulfamerazine	10218401	1
Caelo	Sunflower flower, cut	313A-03521	1
Caelo	Talcum powder	12267423	3
Caelo	Talcum powder	12111301	1
Caelo	Talcum powder	1205046-01	3
Caelo	Talcum powder	12267401	5
Caelo	Talcum powder	11318324	4
Caelo	Talcum powder	11318335	4
Caelo	Talcum powder	28121201	1
Caelo	Talcum powder	15061301	1
Caelo	Talcum powder	13146316	3
Caelo	Talcum powder	13146312	4
Caelo	Talcum powder	13146308	5
Caelo	Talcum powder	13146307	3
Caelo	Talcum powder	13146302	8
Caelo	Talcum powder	11318323	1
Caelo	Talcum powder	12267424	6
Caelo	Talcum powder	2011406	1
Caelo	Talcum powder	9218303	1
Caelo	Talcum powder	11164306	1
Caelo	Talcum powder	11318312	2
Caelo	Talcum powder	11318311	3
Caelo	Talcum powder	12267412	6
Caelo	Talcum powder	11318301	1
Caelo	Talcum powder	11164313	1
Caelo	Tetterwort, cut	311092	1
Caelo	Theriac, powdered	12289307	9

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Theriac, powdered	13407304	2
Caelo	Theriac, powdered	12189401	4
Caelo	Theriac, powdered	12289304	1
Caelo	Theriac, powdered	11081515	1
Caelo	Theriac, powdered	14156501	1
Caelo	Theriac, powdered	412091-2P	1
Caelo	Theriac, powdered	1513E-01351	1
Caelo	Theriac, powdered	15101307	1
Caelo	Theriac, powdered	13407303	1
Caelo	Theriac, powdered	12289312	1
Caelo	Theriac, powdered	12289306	1
Caelo	Theriac, powdered	12289303	1
Caelo	Theriac, powdered	12289301	4
Caelo	Theriac, powdered	15312501	1
Caelo	Theriac, powdered	15312504	1
Caelo	Theriac, powdered	2021301	1
Caelo	Theriac, powdered	12289305	3
Caelo	Theriac, powdered	11082408	1
Caelo	Theriac, powdered	11082409	1
Caelo	Theriac, powdered	11082413	1
Caelo	Theriac, powdered	12189404	2
Caelo	Thiomersal	21051507	1
Caelo	Thiomersal	10296413	1
Caelo	Thyme, rubbed	13048308	1
Caelo	Thyme, rubbed	12111201	1
Caelo	Thyme, rubbed	1134514	1
Caelo	Thyme, rubbed	11345013	6
Caelo	Thyme, rubbed	11345003	2
Caelo	Thyme, rubbed	1134006	1
Caelo	Thyme, rubbed	13011402	1
Caelo	Thyme, rubbed	15101201	1
Caelo	Thyme, rubbed	14119001	1
Caelo	Thyme, rubbed	13081301	1
Caelo	Thyme, rubbed	13048309	4
Caelo	Thyme, rubbed	4021512	1
Caelo	Thyme, rubbed	13048301	16
Caelo	Thyme, rubbed	11121306	1
Caelo	Thyme, rubbed	10365803	1
Caelo	Thyme, rubbed	9366310	1
Caelo	Thyme, rubbed	4622A110728	40
Caelo	Thyme, rubbed	273909	4
Caelo	Thyme, rubbed	11345006	9
Caelo	Thyme, rubbed	11345004	5
Caelo	Thyme, rubbed	10365815	5
Caelo	Thyme, rubbed	10365807	4
Caelo	Thyme, rubbed	11021301	1
Caelo	Thyme, rubbed	8061206	1
Caelo	Thyme, rubbed	6111205	1
Caelo	Thyme, rubbed	4041301	1
Caelo	Thyme, rubbed	1021307	1
Caelo	Thyme, rubbed	11345001	2
Caelo	Thyme, rubbed	10365816	3
Caelo	Thyme, rubbed	13048302	2
Caelo	Thyme, rubbed	26021301	1
Caelo	Thyme, rubbed	25091304	1
Caelo	Thyme, rubbed	25041302	1
Caelo	Thyme, rubbed	23021304	1
Caelo	Thyme, rubbed	13048309-3475312161	1
Caelo	Thyme, rubbed	21121204	1
Caelo	Thyme, rubbed	16011401	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Thyme, rubbed	29011303	1
Caelo	Thyme, rubbed	29101301	1
Caelo	Thyme, rubbed	25091208	1
Caelo	Thyme, rubbed	22021301	1
Caelo	Thyme, rubbed	130448301	1
Caelo	Thyme, rubbed	1213Q-01688	1
Caelo	Thyme, rubbed	11345010	6
Caelo	Thyme, rubbed		2
Caelo	Thyme, rubbed	11345011	18
Caelo	Tinnevelly senna fruit	12267602	1
Caelo	Tinnevelly senna fruit	12267609	4
Caelo	Tinnevelly senna fruit	22061202	1
Caelo	Tinnevelly senna fruit	122676707	1
Caelo	Tinnevelly senna fruit	12267610	1
Caelo	Tinnevelly senna fruit	12267608	1
Caelo	Tinnevelly senna fruit	12267201	1
Caelo	Tinnevelly senna fruit	12267606	1
Caelo	Tinnevelly senna fruit	11003013	1
Caelo	Tinnevelly senna fruit	11003009	2
Caelo	Tinnevelly senna fruit	11003004	1
Caelo	Tonka beans	20111312	1
Caelo	Tonka beans	12144101	1
Caelo	Tonka beans	12145101	3
Caelo	Tormentil rhizome	12040704	2
Caelo	Tormentil rhizome	12040702	1
Caelo	Tormentil rhizome	12040701	1
Caelo	Tormentil rhizome	11102011	1
Caelo	Tormentil rhizome	11102010	2
Caelo	Tormentil rhizome	10081203	1
Caelo	Tormentil rhizome	12040709	1
Caelo	Tormentil rhizome	30011405	1
Caelo	Tormentil rhizome	2512A-02188	1
Caelo	Tormentil rhizome	12216805	1
Caelo	Tormentil rhizome	12216803	4
Caelo	Tormentil rhizome	12216802	1
Caelo	Tormentil rhizome	12040717	1
Caelo	Tormentil rhizome	12040715	1
Caelo	Tormentil rhizome	15364302	3
Caelo	Tormentil rhizome	12216806	1
Caelo	Tormentil rhizome	14008005	1
Caelo	Tormentil rhizome	14008002	2
Caelo	Tormentil rhizome	12216801	5
Caelo	Tormentil rhizome	15178203	1
Caelo	Tormentil rhizome	1914A-02188	1
Caelo	Tormentil rhizome	14140006	1
Caelo	Tormentil rhizome	15178206	1
Caelo	Tormentil rhizome	14360103	1
Caelo	Tormentil rhizome	521305-420	1
Caelo	Tormentil rhizome	4753268	1
Caelo	Tormentil rhizome	14008001	3
Caelo	Tormentil rhizome	13220502	1
Caelo	Tormentil rhizome	411082-2-P	1
Caelo	Tricalcium phosphate	1056303	1
Caelo	Trichloroacetic acid	3071204	1
Caelo	Trichloroacetic acid	10130802	1
Caelo	Trichloroacetic acid	10379401	2
Caelo	Trichloroacetic acid	11011306	1
Caelo	Trichloroacetic acid	12135203	1
Caelo	Trichloroacetic acid	12135207	5
Caelo	Trichloroacetic acid	13056203	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Trichloroacetic acid	13056209	1
Caelo	Trichloroacetic acid	12135210	4
Caelo	Trichloroacetic acid	13056212	1
Caelo	Trichloroacetic acid	13056213	1
Caelo	Trichloroacetic acid	6091306	1
Caelo	Turnera diffusa herb,...	12330407	2
Caelo	Turnera diffusa herb,...	12064103	3
Caelo	Turnera diffusa herb,...	12330402	10
Caelo	Turnera diffusa herb,...	12330403	2
Caelo	Turnera diffusa herb,...	12330401	4
Caelo	Turnera diffusa herb,...	11026607	2
Caelo	Valerian root, cut	13196802	2
Caelo	Valerian root, cut	12033810	1
Caelo	Valerian root, cut	12033811	6
Caelo	Valerian root, cut	12033812	11
Caelo	Valerian root, cut	1203812	1
Caelo	Valerian root, cut	13119002	14
Caelo	Valerian root, cut	13196801	1
Caelo	Valerian root, cut	1319002	1
Caelo	Valerian root, cut	13119004	3
Caelo	Valerian root, cut	13196805	1
Caelo	Valerian root, cut	13196806	4
Caelo	Valerian root, cut	13119003	13
Caelo	Valerian root, cut	12033808	6
Caelo	Valerian root, cut	11349101	5
Caelo	Valerian root, cut	11103608	1
Caelo	Valerian root, cut	11103607	6
Caelo	Valerian root, cut	11103606	1
Caelo	Valerian root, cut	11103602	2
Caelo	Valerian root, cut	11103601	2
Caelo	Valerian root, cut	13196801-3564412081	1
Caelo	Valerian root, cut	3091202	1
Caelo	Valerian root, cut	12033807	1
Caelo	Valerian root, cut	12033806	1
Caelo	Valerian root, cut	12033805	5
Caelo	Valerian root, cut	12033804	5
Caelo	Valerian root, cut	120338012	1
Caelo	Valerian root, cut	11103612	3
Caelo	Valerian root, cut	11103611	1
Caelo	Valerian root, cut	1328	1
Caelo	Valerian root, cut	20081303	1
Caelo	Valerian root, cut	2712A-02167	1
Caelo	Valerian root, cut	13287402	2
Caelo	Valerian root, cut	28101303	1
Caelo	Valerian root, cut	29101303	1
Caelo	Valerian root, cut	31101202	1
Caelo	Valerian root, cut	31121201	1
Caelo	Valerian root, cut	nachprüfung	1
Caelo	Valerian root, powdered	13196802	1
Caelo	Valerian root, powdered	13196806	1
Caelo	Valerian root, powdered	13196809	1
Caelo	Valerian root, powdered	13287402	3
Caelo	Vervain herb, cut	2x12188202	1
Caelo	Vervain herb, cut	11031106	7
Caelo	Vervain herb, cut	11031108	11
Caelo	Vervain herb, cut	11031107	2
Caelo	Vervain herb, cut	13151003	3
Caelo	Vervain herb, cut	13351401	1
Caelo	Vervain herb, cut	15012405	1
Caelo	Vervain herb, cut	3013E-01691	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Vervain herb, cut	19111205	1
Caelo	Vervain herb, cut	12178601	1
Caelo	Vervain herb, cut	12187601	15
Caelo	Vervain herb, cut	12188202	11
Caelo	Vervain herb, cut	12188203	6
Caelo	Vervain herb, cut	11031110	6
Caelo	Vervain herb, cut	11031102	1
Caelo	Vervain herb, cut	11031101	1
Caelo	Vervain herb, cut	110031110	1
Caelo	Vervain herb, cut	13151001	17
Caelo	Vervain herb, cut	11031105	3
Caelo	Vervain herb, cut	12383005	1
Caelo	Vervain herb, cut	6111301	1
Caelo	Vervain herb, cut	10034903	1
Caelo	Vervain herb, cut	12383002	2
Caelo	Vervain herb, cut	11031103	2
Caelo	Vervain herb, cut	11031109	1
Caelo	Violet root	13113404	1
Caelo	Violet root	1026706	1
Caelo	Violet root	11026704	3
Caelo	Violet root	13113401	2
Caelo	Violet root	11026706	1
Caelo	Violet root	nachprüfung	2
Caelo	Violet root	11026701	2
Caelo	Violet root	11026705	2
Caelo	Violet root herb, cut	13038701	4
Caelo	Violet root herb, cut	11124007	1
Caelo	Violet root herb, cut	11124008	2
Caelo	Violet root herb, cut	1021308	1
Caelo	Violet root herb, cut	10011403	1
Caelo	Violet root herb, cut	10291007	1
Caelo	Violet root herb, cut	13232107	1
Caelo	Violet root herb, cut	1303872	1
Caelo	Violet root herb, cut	13038703	3
Caelo	Violet root herb, cut	11124007-3284310662	1
Caelo	Walnut leaves, cut	15126004	1
Caelo	Walnut leaves, cut	11103002	1
Caelo	Walnut leaves, cut	25041404	1
Caelo	Walnut leaves, cut	11103001	2
Caelo	Walnut leaves, cut	414Q1499	1
Caelo	Walnut leaves, cut	12124603-341930192	1
Caelo	Walnut leaves, cut	8071502	1
Caelo	Walnut leaves, cut	12124502	1
Caelo	Walnut leaves, cut	11103008	5
Caelo	Walnut leaves, cut	11103007	8
Caelo	Walnut leaves, cut	11103003	3
Caelo	Walnut leaves, cut	10050413	1
Caelo	Walnut leaves, cut	12124605	7
Caelo	Walnut leaves, cut	11103009	1
Caelo	Walnut leaves, cut	3051301	1
Caelo	Walnut leaves, cut	15126003	5
Caelo	Walnut leaves, cut	14064902	3
Caelo	Walnut leaves, cut	12124607	1
Caelo	Walnut leaves, cut	11103004	6
Caelo	Walnut leaves, cut	14064910	1
Caelo	Walnut leaves, cut	11103010	6
Caelo	Walnut leaves, cut	12124601	7
Caelo	Walnut leaves, cut	12124602	3
Caelo	Walnut leaves, cut	1214603	1
Caelo	Walnut leaves, cut	3712Q-01499	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Walnut leaves, cut	1313M-01499	1
Caelo	Walnut leaves, cut	4713U01499	1
Caelo	Walnut leaves, cut	1414Q01499	1
Caelo	Walnut leaves, cut	14064904	5
Caelo	Walnut leaves, cut	14064909	1
Caelo	Walnut leaves, cut	14064906	4
Caelo	Walnut leaves, cut	15126002	1
Caelo	Walnut leaves, cut	11103005	1
Caelo	Walnut leaves, cut	14064903	1
Caelo	Walnut leaves, cut	nachprüfung	2
Caelo	Walnut shells, cut	11325603	1
Caelo	Walnut shells, cut	11016602	1
Caelo	Walnut shells, cut	11325605	2
Caelo	Walnut shells, cut	11016604	2
Caelo	Walnut shells, cut	11016605	2
Caelo	Watercress herb, cut	12031602	1
Caelo	Watercress herb, cut	13104406	1
Caelo	Watercress herb, cut	13104405	1
Caelo	Watercress herb, cut	13104404	2
Caelo	Watercress herb, cut	13104403	1
Caelo	Watercress herb, cut	13104402	2
Caelo	Watercress herb, cut	13104401	3
Caelo	Watercress herb, cut	107063	1
Caelo	Watercress herb, cut	10224507	1
Caelo	Watercress herb, cut	12031601	1
Caelo	Watercress herb, cut	12031606	1
Caelo	Watercress herb, cut	12031604	2
Caelo	Wild apple pieces, sw...	11229805	1
Caelo	Wild oregano herb	11340703	2
Caelo	Wild oregano herb	12360901	6
Caelo	Wild oregano herb	12360902	2
Caelo	Wild oregano herb	11340709	1
Caelo	Wild oregano herb	11340705	2
Caelo	Wild oregano herb	11340708	1
Caelo	Wild oregano herb	12360904	1
Caelo	Wild thyme herb, cut	13086805	3
Caelo	Wild thyme herb, cut	11031203	1
Caelo	Wild thyme herb, cut	11374803	2
Caelo	Wild thyme herb, cut	11374805	5
Caelo	Wild thyme herb, cut	4501A120813	2
Caelo	Wild thyme herb, cut	11374805i.0.	1
Caelo	Wild thyme herb, cut	111374807	1
Caelo	Wild thyme herb, cut	13086801	1
Caelo	Willow bark, cut	11073201	1
Caelo	Willow bark, cut	11073208	1
Caelo	Willow bark, cut	11073210	4
Caelo	Willow bark, cut	12185201	5
Caelo	Willow bark, cut	12185202	2
Caelo	Willow bark, cut	9071301	1
Caelo	Willow bark, cut	4312E-01305	1
Caelo	Willow bark, cut	272101	1
Caelo	Willow bark, cut	2185206	1
Caelo	Willow bark, cut	13180701	1
Caelo	Willow bark, cut	21011302	1
Caelo	Willow bark, cut	13180705	1
Caelo	Willow bark, cut	12185207	3
Caelo	Willow bark, cut	12185204	5
Caelo	Willow bark, cut	13180705-3530411072	1
Caelo	Willow bark, cut	13180702	3
Caelo	Willow bark, cut	12185206	4

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Willow bark, cut	12185208	14
Caelo	Willow flowers herb, ...	11347318	2
Caelo	Willow flowers herb, ...	10194216	1
Caelo	Willow flowers herb, ...	11347311	1
Caelo	Willow flowers herb, ...	13104702	1
Caelo	Willow flowers herb, ...	11347316	1
Caelo	Willowherb, small-flo...	15011411	1
Caelo	Willowherb, small-flo...	15101302	1
Caelo	Willowherb, small-flo...	13200201	3
Caelo	Willowherb, small-flo...	13355906	1
Caelo	Willowherb, small-flo...	10326107	1
Caelo	Willowherb, small-flo...	10326104	5
Caelo	Willowherb, small-flo...	7071201	1
Caelo	Willowherb, small-flo...	613M-01641	1
Caelo	Willowherb, small-flo...	2081305	1
Caelo	Willowherb, small-flo...	1031301	1
Caelo	Willowherb, small-flo...	10326109	3
Caelo	Willowherb, small-flo...	12041301	1
Caelo	Willowherb, small-flo...	12064506	1
Caelo	Willowherb, small-flo...	12117701	2
Caelo	Willowherb, small-flo...	13071301	1
Caelo	Willowherb, small-flo...	31101303	1
Caelo	Willowherb, small-flo...	28031318	1
Caelo	Willowherb, small-flo...	2412E-01641	1
Caelo	Willowherb, small-flo...	412041	1
Caelo	Willowherb, small-flo...	10326108	14
Caelo	Willowherb, small-flo...	21061307	1
Caelo	Willowherb, small-flo...	22011304	1
Caelo	Willowherb, small-flo...	18031305	1
Caelo	Willowherb, small-flo...	29121201	1
Caelo	Witch hazel bark, cut	12361303	1
Caelo	Witch hazel bark, cut	13123703	1
Caelo	Witch hazel bark, cut	nachprüfung	1
Caelo	Witch hazel bark, cut	13123701	1
Caelo	Witch hazel bark, cut	12361301	1
Caelo	Witch hazel leaves, cut	14356103	1
Caelo	Witch hazel leaves, cut	13269905	1
Caelo	Witch hazel leaves, cut	13269904	1
Caelo	Witch hazel leaves, cut	13269902	2
Caelo	Witch hazel leaves, cut	12164802	1
Caelo	Witch hazel leaves, cut	12164804	2
Caelo	Witch hazel leaves, cut	12165805	1
Caelo	Witch hazel leaves, cut	10102915	1
Caelo	Wood betony herb, cut	13048906	1
Caelo	Wood betony herb, cut	11247205	1
Caelo	Wood betony herb, cut	12007208	1
Caelo	Wood betony herb, cut	134048903	1
Caelo	Wood betony herb, cut	13367802	1
Caelo	Woodruff herb, cut	10375812	2
Caelo	Woodruff herb, cut	10375802	1
Caelo	Woodruff herb, cut	91789309	1
Caelo	Woodruff herb, cut	12103509	2
Caelo	Woodruff herb, cut	4409M-01621	1
Caelo	Woodruff herb, cut	12103510	1
Caelo	Woodruff herb, cut	12103513	2
Caelo	Woodruff herb, cut	12103514	1
Caelo	Woodruff herb, cut	18031304	1
Caelo	Woodruff herb, cut	nachprüfung	2
Caelo	Woodruff herb, cut	52236077	1
Caelo	Wormwood herb, cut	13174402	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Wormwood herb, cut	13174403	1
Caelo	Wormwood herb, cut	13381905	2
Caelo	Wormwood herb, cut	12355808	2
Caelo	Wormwood herb, cut	11285804	1
Caelo	Wormwood herb, cut	11285805	4
Caelo	Wormwood herb, cut	12103002	1
Caelo	Wormwood herb, cut	12355804	9
Caelo	Wormwood herb, cut	11285802	3
Caelo	Wormwood herb, cut	1108508	1
Caelo	Wormwood herb, cut	12355805	5
Caelo	Wormwood herb, cut	12355807	9
Caelo	Wormwood herb, cut	7011401	1
Caelo	Wormwood herb, cut	7031301	1
Caelo	Wormwood herb, cut	11285811	4
Caelo	Wormwood herb, cut	6101203	1
Caelo	Wormwood herb, cut	11285809	1
Caelo	Wormwood herb, cut	12355801	23
Caelo	Wormwood herb, cut	12355802	4
Caelo	Wormwood herb, cut	12355803	34
Caelo	Wormwood herb, cut	12103003	12
Caelo	Wormwood herb, cut	11285806	2
Caelo	Wormwood herb, cut	11285803	3
Caelo	Wormwood herb, cut	13381902	3
Caelo	Wormwood herb, cut	13174401	3
Caelo	Wormwood herb, cut	13387008	1
Caelo	Wormwood herb, cut	15408304	1
Caelo	Wormwood herb, cut	1911E-01611	1
Caelo	Wormwood herb, cut	2213M-01611	1
Caelo	Wormwood herb, cut	272957	3
Caelo	Wormwood herb, cut	277513	2
Caelo	Wormwood herb, cut	nachprüfung	1
Caelo	Yarrow flower, rubbed	12363005	5
Caelo	Yarrow flower, rubbed	12338306	1
Caelo	Yarrow flower, rubbed	12267703	3
Caelo	Yarrow flower, rubbed	12363002	6
Caelo	Yarrow flower, rubbed	13350507	1
Caelo	Yarrow flower, rubbed	70139427	1
Caelo	Yarrow flower, rubbed	12363007	1
Caelo	Yarrow herb, cut	11280517	2
Caelo	Yarrow herb, cut	11306301	1
Caelo	Yarrow herb, cut	11306303	2
Caelo	Yarrow herb, cut	11306304	1
Caelo	Yarrow herb, cut	12041302	1
Caelo	Yarrow herb, cut	12336306	1
Caelo	Yarrow herb, cut	12379602	17
Caelo	Yarrow herb, cut	12379601	11
Caelo	Yarrow herb, cut	12338311	2
Caelo	Yarrow herb, cut	12338306	5
Caelo	Yarrow herb, cut	12338305	12
Caelo	Yarrow herb, cut	12338304	16
Caelo	Yarrow herb, cut	11280512	7
Caelo	Yarrow herb, cut	11280503	1
Caelo	Yarrow herb, cut	11218404	2
Caelo	Yarrow herb, cut	13029107-3436311151	1
Caelo	Yarrow herb, cut	13029107-3418310182	1
Caelo	Yarrow herb, cut	12338306-3358319071	1
Caelo	Yarrow herb, cut	12338303	10
Caelo	Yarrow herb, cut	5021302	1
Caelo	Yarrow herb, cut	11280511	6
Caelo	Yarrow herb, cut	10101205	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caelo	Yarrow herb, cut	10081301	1
Caelo	Yarrow herb, cut	9121304	1
Caelo	Yarrow herb, cut	9101311	1
Caelo	Yarrow herb, cut	8011421	1
Caelo	Yarrow herb, cut	12379603	5
Caelo	Yarrow herb, cut	16041302	1
Caelo	Yarrow herb, cut	15006720	1
Caelo	Yarrow herb, cut	15006713	1
Caelo	Yarrow herb, cut	15006708	1
Caelo	Yarrow herb, cut	1408510	1
Caelo	Yarrow herb, cut	14018516	1
Caelo	Yarrow herb, cut	2311E-01665	1
Caelo	Yarrow herb, cut	H-220313-1	1
Caelo	Yarrow herb, cut		3
Caelo	Yarrow herb, cut	3313Q-01665	1
Caelo	Yarrow herb, cut	31121207	1
Caelo	Yarrow herb, cut	29071301	1
Caelo	Yarrow herb, cut	27011404	1
Caelo	Yarrow herb, cut	14018508	1
Caelo	Yarrow herb, cut	13029108	7
Caelo	Yarrow herb, cut	13029107	2
Caelo	Yarrow herb, cut	13029106	12
Caelo	Yarrow herb, cut	13029105	4
Caelo	Yarrow herb, cut	13029104	2
Caelo	Yarrow herb, cut	12379606	10
Caelo	Yarrow herb, cut	130291103	1
Caelo	Yarrow herb, cut	13381810	1
Caelo	Yarrow herb, cut	13381805	1
Caelo	Yarrow herb, cut	13381804	2
Caelo	Yarrow herb, cut	130929105	1
Caelo	Yarrow herb, cut	1309106	1
Caelo	Yarrow herb, cut	13381806	2
Caelo	Zedoary rhizome, cut	nachprüfung	1
Caelo	Zedoary rhizome, cut	25111304	1
Caelo	Zedoary rhizome, cut	13010106	4
Caelo	Zedoary rhizome, cut	13010102	4
Caelo	Zedoary rhizome, cut	12125304	2
Caelo	Zedoary rhizome, cut	12125303	1
Caelo	Zedoary rhizome, cut	111091607	1
Caelo	Zedoary rhizome, cut	11091603	1
Caelo	Zedoary rhizome, cut	11091604	1
Caelo	Zedoary rhizome, powd...	12344605	1
Caelo	Zedoary rhizome, powd...	15277101	1
Caelo	Zedoary rhizome, powd...	13165504	4
Caelo	Zedoary rhizome, powd...	12007504	1
Caelo	Zedoary rhizome, powd...	13165501	2
Caelo	Zinc sulfate heptahyd...	12257809	3
Caelo	Zinc sulfate heptahyd...	4012Q-02798	1
Caelo	Zinc sulfate heptahyd...	CH:001/0913	1
Caelo	Zinc sulfate heptahyd...	12257818	1
Caelo	Zinc sulfate heptahyd...	81554199	1
Caelo	Zinc sulfate heptahyd...	12257802	1
Caelo	Zinc sulfate heptahyd...	11095621	1
Caelo	Zinc sulfate heptahyd...	110500201	1
Caelo	Zinc sulfate heptahyd...	12257816	1
Caelo	Zinc sulfate heptahyd...	11095601	1
Caesar & Lorenz	Caraway	12226609	4
Caesar & Lorenz	Yarrow herb, cut	12379605	4
Caesar & Loretz	Kaolin, heavy	13041801	4
Caesar & Loretz GmbH	Hawthorn flower	11068206	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar & Loretz GmbH	Magnesium chloride he...	13064223	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711 (1)	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199712	1
Caesar & Loretz GmbH	Morphine hydrochloride	15199711 (2)	1
Caesar & Loretz GmbH ...	Bitter fennel	11016319	4
Caesar & Loretz GmbH ...	Black mustard seed, p...	11276701	3
Caesar & Loretz GmbH ...	Liquorice root, peeled	11034014	4
Caesar & Loretz GmbH ...	Mallow flower, cut	10357901	2
Caesar & Loretz GmbH ...	Nettle leaves, cut	10291405	3
Caesar & Loretz GmbH ...	Plantain leaves, cut	10315707	5
Caesar & Loretz GmbH ...	Raspberry leaves, cut	10013408	3
Caesar & Loretz GmbH ...	Sage leaves, cut	11056109	8
Caesar & Loretz GmbH ...	Senna leaves, cut	11041012	1
Caesar & Loretz GmbH ...	Senna leaves, cut	11277303	5
Caesar & Loretz GmbH ...	Tinnevelly senna fruit	11003003	1
Caesar & Loretz GmbH ...	Aluminium chloride he...	12114918	16
Caesar & Loretz GmbH ...	Potassium hydroxide	12057902	2
Caesar & Loretz GmbH ...	Sage leaves, cut	11056121	4
Caesar & Loretz GmbH ...	Black cumin seed	LMV1505024	1
Caesar & Loretz GmbH...	Aluminium chloride he...	12047508	5
Caesar & Loretz GmbH...	Aluminium chloride he...	12323711	19
Caesar & Loretz GmbH...	Anise	12226402	5
Caesar & Loretz GmbH...	Bitter fennel	12094711	3
Caesar & Loretz GmbH...	Bitter fennel	12094705	3
Caesar & Loretz GmbH...	Bitter fennel	12094705	5
Caesar & Loretz GmbH...	Bitter fennel	12094707	8
Caesar & Loretz GmbH...	Caraway	11003213	2
Caesar & Loretz GmbH...	Caraway	9267824	2
Caesar & Loretz GmbH...	Gentian root, cut	12244603	2
Caesar & Loretz GmbH...	Horsetail herbs, cut	10375510	1
Caesar & Loretz GmbH...	Mate leaves, cut	13118002	8
Caesar & Loretz GmbH...	Nettle leaves, cut	10291423	9
Caesar & Loretz GmbH...	Sage leaves, cut	12370002	4
Caesar & Loretz GmbH...	Sage leaves, cut	12370010	16
Caesar & Loretz GmbH...	Sage leaves, cut	11347502	6
Caesar & Loretz GmbH...	Sage leaves, cut	12370016	6
Caesar & Loretz GmbH...	Senna leaves, cut	11277314	4
Caesar & Loretz GmbH...	Senna leaves, cut	12273103	13
Caesar & Loretz GmbH...	Senna leaves, cut	11277308	3
Caesar & Loretz GmbH...	Senna leaves, cut	13136708	6
Caesar & Loretz GmbH...	Sodium hydrogen carbo...	13060102	4
Caesar & Loretz GmbH...	Tinnevelly senna fruit	11003012	1
Caesar & Loretz GmbH...	Tinnevelly senna fruit	12267603	1
Caesar & Loretz GmbH...	Tinnevelly senna fruit	12267601	1
Caesar & Loretz GmbH...	Tinnevelly senna fruit	11003014	1
Caesar & Loretz GmbH...	Wild thyme herb, cut	11374802	1
Caesar & Loretz/ Noweda	Heavy alkaline bismut...	12145701	1
Caesar & Loretz/ Noweda	Hyssop herb, cut	11374301	1
Caesar & Loretz/ Noweda	Ivy leaves, cut	12225606	5
Caesar & Loretz/Noweda	Anise	153986002	1
Caesar & Loretz/Noweda	Bitter fennel	15443203	1
Caesar & Loretz/Noweda	Caraway	15056601	1
Caesar&Loretz GmbH D-...	Senna leaves, cut	12115504	5
Caesar&loretz,AHC	Nystatin	14196509	2
Caesar&loretz,Anzag	Nystatin	12158008	9
Caesar&loretz,Phoenix	Frangula bark, cut	14163104	1
Caesar&loretz,Phoenix	Genuine cleaver's her...	14019206	1
Caesar&loretz,Phoenix	Genuine cleaver's her...	14019215	1
Caesar&loretz,Phoenix	Marjoram herb, rubbed	14181005	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Caesar&loretz,Phoenix	Nystatin	1111057-01	13
Caesar&loretz,Phoenix	Nystatin	14363512	2
Caesar&loretz,Phoenix	Nystatin	1218008	1
Caesar&loretz,Phoenix	Nystatin	13173408	2
caesar&loretz,Phönix	Iceland moss, cut	14304404	2
Caesar/Noweda	Aluminium potassium s...	12184411	2
Caesar/Noweda	Bogbean leaves, cut	1510U-01517	1
Caesar/Noweda	Cape aloe, cut	2013E-01089	1
Caesar/Noweda	Cape aloe, cut	12338211	1
Caesar/Noweda	Clubmoss herb, cut	1255008	1
Caesar/Noweda	Coriander	2010M-01539	1
Caesar/Noweda	Couchgrass root rhizo...	12186813	6
Caesar/Noweda	Elder flower, rubbed	4910A-01471	1
Caesar/Noweda	Flohsamen	12276501	3
Caesar/Noweda	Flohsamen	11185817	3
Caesar/Noweda	Indian psyllium	12276503	1
Caesar/Noweda	Indian psyllium	12276509	3
Caesar/Noweda	Indian psyllium	12276516	1
Caesar/Noweda	Liverleaf herbs, cut	11254608	1
Caesar/Noweda	Mullein flower, cut	2810E-01475	1
Caesar/Noweda	Restharrow root, cut	71015/3	2
Caesar/Noweda	Theriac, powdered	12289309	1
caeser&loretz, 09.11....	Podophyllum resin (fr...	11085813	1
Caleo/ Anzag	Wormwood herb, cut	11285810	6
calo	Clubmoss herb, cut	11255006	1
carotech	Tocomax 20%	A3_200003_1/5	1
Cealo	Calcium hydrogen phos...	12212811	4
Cealo	Indian psyllium	12276502	5
Cealo	Magnesium chloride he...	112354615	1
Cealo	Magnesium chloride he...	11354615	1
celo	Genuine cleaver's her...	nachprüfung	1
celo	Watercress herb, cut	nachprüfung	1
celo	Yarrow herb, cut	nachprüfung	1
Celo	Agrimony herb, cut	11374003	1
Changsha staherb natu...	Amygdalin	STA-13032202	1
Chiesi/Phönix	Black cumin seed	14359906	2
China Medica	Raspberry leaves, cut	13086703	1
china medica 14.06.2013	Angelica root	98019	1
china medica 14.06.2013	Cinnamon bark, cut	210842	1
china medica 14.06.2013	Cinnamon bark, sticks	210810	1
china medica 14.06.2013	Rhubarb root, cut	20072	1
china medica 14.06.2013	Water plantain, cut	30065	1
Clariant - Mindel-Food	Bentonite	1301	1
Creapure	Creatine	515941	1
Defektur	Bitter fennel	26813035/12	1
Defektur	Bitter fennel	52/13	1
Defektur	Bitter fennel	7/13	1
Defektur	Bitter fennel	57/13	1
Defektur	Matricaria flower	10/13	1
Defektur	Matricaria flower	29/13	1
Defektur	Matricaria flower	59/13	1
Degussa / falcento	Creatine	422031	1
Denk	D-(+)-mannose	R-4680	1
Dr. Behr	Dimercaptosuccinic acid	WE14020002	1
Dr. Behr GmbH	Dimercaptosuccinic acid	WE14070074(003)/14G	1
Dr. Behr GmbH	Glucosamine sulfate 2...	4121205	1
Dr.Behr GmbH	Dimercaptosuccinic acid	WE15060032/D1/150500	1
ebert u.jacobi	Marian thistle fruit	287527	1
Erfurter Ölmühle	Flaxseeds		1
Erika apotheke	Fumitory herb, cut	11101412	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Erika apotheke	Marian thistle fruit	11126704	3
Erika apotheke	Nettle leaves, cut	12184003	23
Eu Rho	Sodium hydrogen carbo...	1203030-01	13
EuRho	Aluminium chloride he...	1106017-01	2
EuRho	Aluminium chloride he...	2512I01095	1
EuRho	Aluminium chloride he...	d024a	1
EuRho	Dithranole	1203025-01	1
EuRho	Magnesium sulfate hep...	3512M-01835	1
EuRho	Sodium sulfate decahy...	1210005-01	3
EuRho	Tricalcium phosphate	13031203	1
Eurho/Noweda	Black mustard seed, p...	13356304	1
Eurho/Phoenix	Midazolam hydrochloride	12L17-N10	1
euro	Sodium hydrogen carbo...	110902901	1
Euro / Jenne	Magnesium sulfate hep...	1401029-01	2
Euro OTC	Aluminium chloride he...	1109025-02	5
Euro OTC	Aluminium chloride he...	1204026-02	18
Euro OTC	Aluminium chloride he...	1210014-02-336331909	1
Euro OTC	Aluminium chloride he...	2111Q-01095	1
Euro OTC	Aluminium chloride he...	1507002-01	1
Euro OTC	Aluminium chloride he...	1210012-01	1
Euro OTC	Aluminium chloride he...	1213M-01095	1
Euro OTC	Aluminium chloride he...	1106017-02	3
Euro OTC	Aluminium chloride he...	co31a	1
Euro OTC	Aluminium chloride he...	1307011-01	10
Euro OTC	Aluminium chloride he...	121001401	4
Euro OTC	Aluminium chloride he...	1103007-01	2
Euro OTC	Aluminium chloride he...	120402602	1
Euro OTC	Aluminium chloride he...	120402601	4
Euro OTC	Aluminium chloride he...	1307011-02	2
Euro OTC	Aluminium potassium s...	1004046-02	1
Euro OTC	Ammonium chloride	1203029-01	3
Euro OTC	Ammonium chloride	1212017-01	2
Euro OTC	Ammonium chloride	512A-01104	1
Euro OTC	Amygdalin	NF-A20130203	1
Euro OTC	Chromium yeast 0.2%	L1502003-01	1
Euro OTC	Chromium yeast 0.2%	L1311026-01	1
Euro OTC	Chromium yeast 0.2%	1406030-01	1
Euro OTC	Chromium yeast 0.2%	1303028-01	1
Euro OTC	Chromium yeast 0.2%	L1507039-01	1
Euro OTC	Chromium yeast 0.2%	L1406030-01	1
Euro OTC	Common centaury, cut	272897	3
Euro OTC	Copper orotate dihydr...	1206035-01	2
Euro OTC	Copper orotate dihydr...	2106001Z-01	1
Euro OTC	Curcuma dry extract 95%	L1107001	1
Euro OTC	D-(+)-mannose	L1111005-01	2
Euro OTC	Dandelion herb with r...	11030312	6
Euro OTC	Dithranole	DT/370/2012	1
Euro OTC	Dithranole	B:1008011-01	1
Euro OTC	Dithranole	56/11072013	1
Euro OTC	Dithranole	2902060-02	1
Euro OTC	Dithranole	20280812-1	1
Euro OTC	Dithranole	1008011-01	1
Euro OTC	Dithranole	1008011-02	3
Euro OTC	Dithranole	1203025-02	20
Euro OTC	Dithranole	1311029-01	2
Euro OTC	Frankincense granules	10349212	2
Euro OTC	Griffonia seed extract	1205027	1
Euro OTC	Heavy magnesium oxide	1012033-01	1
Euro OTC	Heavy magnesium oxide	1205012-01	2
Euro OTC	Heavy magnesium oxide	1111006-01	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Heavy, basic magnesiu...	1211005-01	4
Euro OTC	Heavy, basic magnesiu...	1205013-02	1
Euro OTC	Heavy, basic magnesiu...	1305024-01	1
Euro OTC	Horsetail herbs, cut	3831A130610	2
Euro OTC	Hyssop herb, cut	nachprüfung	1
Euro OTC	Indian frankincense d...	1104005-01	1
Euro OTC	Indian frankincense d...	1104005V-04	2
Euro OTC	Indian frankincense d...	1112016-01	1
Euro OTC	Magnesium chloride he...	1204017-01	2
Euro OTC	Magnesium chloride he...	1212013-01	4
Euro OTC	Magnesium chloride he...	1112013-01	2
Euro OTC	Magnesium sulfate hep...	130300801	2
Euro OTC	Magnesium sulfate hep...	1109023-01	2
Euro OTC	Magnesium sulfate hep...	1206019-01	7
Euro OTC	Magnesium sulfate hep...	170610	1
Euro OTC	Magnesium sulfate hep...	1211022-01	7
Euro OTC	Magnesium sulfate hep...	1202017-01	6
Euro OTC	Magnesium sulfate hep...	1306015-01	1
Euro OTC	Marian thistle herb, ...	3701A-111207	1
Euro OTC	Matricaria flower	12361702	7
Euro OTC	Methadone hydrochloride	14C24-B01	1
Euro OTC	Milkvetch, powdered	12285401	1
Euro OTC	Nettle seeds	12131507	2
Euro OTC	Nystatin	121024-01	1
Euro OTC	Nystatin	1207009-02	5
Euro OTC	Nystatin	1307053-01	7
Euro OTC	Nystatin	1511020-02	1
Euro OTC	Nystatin	19500711	1
Euro OTC	Nystatin	1511020-01	1
Euro OTC	Nystatin	1212024-02	18
Euro OTC	Nystatin	121202401	1
Euro OTC	Nystatin	1212024-01	21
Euro OTC	Nystatin	111105701	1
Euro OTC	Nystatin	C129854	1
Euro OTC	Nystatin	C129531	1
Euro OTC	Nystatin	C129440	1
Euro OTC	Nystatin	130705301	1
Euro OTC	Nystatin	B:1107046-01	1
Euro OTC	Nystatin	110704601	1
Euro OTC	Nystatin	1107046-01	9
Euro OTC	Nystatin	2811032-01	1
Euro OTC	Nystatin	1307053-02	3
Euro OTC	Nystatin	4014991	2
Euro OTC	Potassium hydrocarbon...	70913Kahyca	1
Euro OTC	Potassium hydrocarbon...	1202013-01	1
Euro OTC	Potassium hydrocarbon...	1204038-01	2
Euro OTC	Potassium hydrocarbon...	1208010-01	4
Euro OTC	Potassium hydrocarbon...	2712008-01	1
Euro OTC	Potassium hydrocarbon...	2809033-01	1
Euro OTC	Potassium hydrocarbon...	4413I1728	1
Euro OTC	Sodium dihydrogen pho...	1209004-01	2
Euro OTC	Sodium dihydrogen pho...	1305028-01	1
Euro OTC	Sodium hydrogen carbo...	120800801	2
Euro OTC	Sodium hydrogen carbo...	1304017-01	4
Euro OTC	Sodium hydrogen carbo...	1304017-02	2
Euro OTC	Sodium hydrogen carbo...	1203030-02	8
Euro OTC	Sodium hydrogen carbo...	120303001	1
Euro OTC	Sodium hydrogen carbo...	1109029-01	11
Euro OTC	Sodium hydrogen carbo...	1104013-01	3
Euro OTC	Sodium hydrogen carbo...	1012011-01	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Euro OTC	Sodium sulfate decahy...	1108035-01	3
Euro OTC	Sodium sulfate decahy...	4312I-01920	1
Euro OTC	Sodium sulfate decahy...	1108035-02	4
Euro OTC	Sodium sulfate decahy...	121000502	2
Euro OTC	Talcum powder	1210052-01	5
Euro OTC	Talcum powder	1305022-01	7
Euro OTC	Tocomax 20%	100912	1
Euro OTC	Tricalcium phosphate	1206002-01	4
Euro OTC	Tricalcium phosphate	1304025-01	2
Euro OTC	Witch hazel leaves, cut	12164805	4
Euro OTC	Zinc orotate dihydrate	1107029-1	1
Euro OTC	Zinc sulfate heptahyd...	1201031-01	1
Euro OTC	Zinc sulfate heptahyd...	1201031-02	1
Euro OTC	Zinc sulfate heptahyd...	1105002-01	2
Euro OTC	Zinc sulfate heptahyd...	1309011_0	1
Euro OTC	Zinc sulfate heptahyd...	1201031-2	1
EUro/AHD	Calcium chloride dihy...	1205014-02	2
euroho/gehe	Sodium hydrogen carbo...	123030-02	1
Euroo/Phoenix	Aluminium chloride he...	120014-02	1
Extrakt Chemie	Cowberry dry extract ...	17320/01	1
Faagron	Methadone hydrochloride	1437H011	1
Fagron	Aluminium chloride he...	13D22.-N09	1
Fagron	Aluminium chloride he...	13D22-09	1
Fagron	Aluminium chloride he...	13D22N09	2
Fagron	Aluminium chloride he...	5213A1095	1
Fagron	Aluminium chloride he...	2405211095	1
Fagron	Aluminium chloride he...	8547287	1
Fagron	Aluminium chloride he...	C012A	1
Fagron	Aluminium chloride he...	2013U-01095	1
Fagron	Aluminium chloride he...	1910211095	1
Fagron	Aluminium chloride he...	2913U1095	1
Fagron	Aluminium chloride he...	1901211095	1
Fagron	Aluminium chloride he...	13d22no9	1
Fagron	Aluminium chloride he...	11G05-No2	1
Fagron	Aluminium chloride he...	12c07n01	1
Fagron	Aluminium chloride he...	12G05-NO	1
Fagron	Aluminium chloride he...	12G05-N10	29
Fagron	Aluminium chloride he...	12g05-n10	1
Fagron	Aluminium chloride he...	12I27-N01	11
Fagron	Aluminium chloride he...	105282-0001	1
Fagron	Aluminium chloride he...	11C07_N05	1
Fagron	Aluminium chloride he...	12I-27-N01	1
Fagron	Aluminium chloride he...	105282-0002	1
Fagron	Aluminium chloride he...	11/23-N06B206A	1
Fagron	Aluminium chloride he...	11 23-N06	1
Fagron	Aluminium chloride he...	12i27-N01	2
Fagron	Aluminium chloride he...	12047512	3
Fagron	Aluminium chloride he...	12/27/N01	1
Fagron	Aluminium chloride he...	12/11-No3	1
Fagron	Aluminium chloride he...	12I27-N01	5
Fagron	Aluminium chloride he...	1207211095	1
Fagron	Aluminium chloride he...	1227N01	1
Fagron	Aluminium chloride he...	12323702	17
Fagron	Aluminium chloride he...	C181A	2
Fagron	Aluminium chloride he...		3
Fagron	Aluminium chloride he...	12L11-N03	3
Fagron	Aluminium chloride he...	11G05-N02	1
Fagron	Aluminium chloride he...	11I23-N06	3
Fagron	Aluminium potassium s...	A1-063-AL	1
Fagron	Aluminium potassium s...	A1-063-A1	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Aluminium potassium s...	13D29-N04	1
Fagron	Aluminium potassium s...	12I24-M03	1
Fagron	Aluminium potassium s...	13D08-N01	2
Fagron	Aluminium potassium s...	12/24-M02	1
Fagron	Aluminium potassium s...	11F20-M12	1
Fagron	Amphetamine sulfate	12B06-N13	3
Fagron	Amphetamine sulfate	12/24N-03	1
Fagron	Amphetamine sulfate	78012	1
Fagron	Amphetamine sulfate	12E11-N06	5
Fagron	Amphetamine sulfate	13J18-B40-290538	2
Fagron	Amphetamine sulfate	CH13B11-N04	1
Fagron	Amphetamine sulfate	13B11-N04	5
Fagron	Amphetamine sulfate	11D04-N13	1
Fagron	Amphetamine sulfate	88689	2
Fagron	Amphetamine sulfate	13/18-B40-290538	1
Fagron	Amphetamine sulfate	16A29-B03	1
Fagron	Amphetamine sulfate	13J18B40	1
Fagron	Amphetamine sulfate	11/01-N01	1
Fagron	Amphetamine sulfate	2213Q-03361	1
Fagron	Amphetamine sulfate	14E19-B09	2
Fagron	Amphetamine sulfate	14E19-B09-304502	2
Fagron	Amphetamine sulfate	14E19-B09-294572	2
Fagron	Amphetamine sulfate	14E19-B09-294573	1
Fagron	Amphetamine sulfate	16A29-B03-318743	1
Fagron	Amphetamine sulfate	13J18-B40	1
Fagron	Anise	13037801	2
Fagron	Betamethasone-17-vale...	12J19-N06	1
Fagron	Betamethasone-17-vale...	12L19-N06	2
Fagron	Betamethasone-17-vale...	12G02-N15	2
Fagron	Betamethasone-17-vale...	12A05-N08	1
Fagron	Birch leaves, cut	7061301	1
Fagron	Bitter almonds	40A121010	11
Fagron	Bitter fennel	12094708	3
Fagron	Bitter fennel	6858913	1
Fagron	Bitter fennel	1406211545	1
Fagron	Bitter fennel		1
Fagron	Black mustard seed, p...	14293705	1
Fagron	Bogbean leaves, cut	2371B100616	1
Fagron	Calcium hydroxide	13D26-N14	1
Fagron	Calcium hydroxide	12J18-N01	1
Fagron	Calcium hydroxide	12G04-N22	1
Fagron	Clobetasol-17-propion...	12I19-N01	1
Fagron	Clobetasol-17-propion...	12/19-No1	1
Fagron	Clobetasol-17-propion...	12L19-N06	1
Fagron	Clobetasol-17-propion...	12L19-N01	1
Fagron	Clobetasol-17-propion...	12K08-N02	2
Fagron	Clobetasol-17-propion...	12A03-N03	2
Fagron	Clobetasol-17-propion...	12/19-N01003637	1
Fagron	Cocaine hydrochloride	12G23-N13	1
Fagron	Codeine phosphate hem...	13/27-N06	2
Fagron	Codeine phosphate hem...	913I-01279	1
Fagron	Codeine phosphate hem...	13E21-N04	1
Fagron	Codeine phosphate hem...	13C11-N10	1
Fagron	Codeine phosphate hem...	12C05-N01	1
Fagron	Codeine phosphate hem...	11L20-N04	1
Fagron	Codeine phosphate hem...	11/19-N10	1
Fagron	Codeine phosphate hem...	13I27-N06	2
Fagron	Codeine phosphate hem...	15B17-B99-304623	1
Fagron	Codeine phosphate hem...	15F09-B02-310520	2
Fagron	Codeine phosphate hem...	1615I-01279	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Copper (II) sulfate p...	13A25-N06	2
Fagron	Dexamethasone 1:10 (r...	12K06-N09	1
Fagron	Dexamethasone 1:10 (r...	12C20-N03	4
Fagron	Dexamethasone 1:10 (r...	12L19-N06	1
Fagron	Dexamphetamine sulfate	12J15-N07	1
Fagron	Dexamphetamine sulfate	11F29-N01	1
Fagron	Dexamphetamine sulfate	13I23-N01	1
Fagron	Dihydrocodeine hydrog...	13H19-N08	2
Fagron	Dihydrocodeine hydrog...	14K26-B04-310974	1
Fagron	Dihydrocodeine hydrog...	12G05-N01	1
Fagron	Dithranole	17710I-01274	1
Fagron	Dithranole	13A30-N01	4
Fagron	Dithranole	Ch13A30-N01	1
Fagron	Dithranole	APDT/375/2012D	15
Fagron	Fentanyl citrate	20100911-1	1
Fagron	Fentanyl citrate	12G02-N03	1
Fagron	Fentanyl citrate	10H20-N02	1
Fagron	Fenugreek seeds, powd...	12149603	1
Fagron	Flohsamen	3610U-02243	1
Fagron	Frankincense granules		1
Fagron	Fuchsine	13A30-N05	2
Fagron	Fuchsine	12A03-N06	2
Fagron	Fuchsine	13H23-M04	2
Fagron	Fuchsine	12F28-N02	1
Fagron	Fuchsine	12G18-N01	1
Fagron	Genuine cleaver's her...	12369004	2
Fagron	Heavy alkaline bismut...	12C08-N06	2
Fagron	Heavy alkaline bismut...	12d26-no3	1
Fagron	Heavy alkaline bismut...	11D28-N16	1
Fagron	Heavy alkaline bismut...	1001311186	1
Fagron	Heavy alkaline bismut...	42000079	1
Fagron	Heavy alkaline bismut...	13H28-B04-291385	1
Fagron	Heavy alkaline bismut...	13C15-N05	3
Fagron	Heavy alkaline bismut...	13B25-N02	4
Fagron	Heavy alkaline bismut...	1309211186	1
Fagron	Heavy alkaline bismut...	11/13-N01	1
Fagron	Heavy alkaline bismut...	12D26-N03	1
Fagron	Heavy, basic magnesiu...	12F20-N04	1
Fagron	Heavy, basic magnesiu...	13A10-N02	1
Fagron	Hydromorphone hydroch...	12G05-N02	1
Fagron	Lady's mantle herb, cut	11182802	1
Fagron	Lungwort herb, cut	Nachprüfung	1
Fagron	Magnesium chloride he...	13411207	1
Fagron	Magnesium chloride he...	1304C004-281210	1
Fagron	Magnesium chloride he...	13B14-B01-287292	1
Fagron	Magnesium chloride he...	26061305	1
Fagron	Magnesium chloride he...	29011304	1
Fagron	Magnesium chloride he...	M1555	1
Fagron	Magnesium chloride he...	1304c004-281210	1
Fagron	Magnesium chloride he...	12H21-N02	7
Fagron	Magnesium chloride he...	12D11-N01	1
Fagron	Magnesium chloride he...	12D11-N01	5
Fagron	Magnesium chloride he...	12B16-N01	6
Fagron	Magnesium chloride he...	M1625	1
Fagron	Magnesium chloride he...	11K17-N10	3
Fagron	Magnesium chloride he...	M1430	1
Fagron	Magnesium chloride he...	11K17-N01	1
Fagron	Magnesium chloride he...	12h21-N02	1
Fagron	Magnesium chloride he...	1301C012-277804	1
Fagron	Magnesium chloride he...	1301C10-277801	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Magnesium chloride he...	1304C001-281211	1
Fagron	Magnesium chloride he...	1301C011-277803	1
Fagron	Magnesium chloride he...	1301C009-277802	4
Fagron	Magnesium chloride he...	1301c009-277802	1
Fagron	Magnesium chloride he...	12H21-No2	1
Fagron	Magnesium chloride he...	1301C10	3
Fagron	Magnesium sulfate hep...	13H05-N02	1
Fagron	Magnesium sulfate hep...	31161	2
Fagron	Magnesium sulfate hep...	12L10-N07	1
Fagron	Magnesium sulfate hep...	12G24-N02	1
Fagron	Marian thistle fruit	10270608	1
Fagron	Marigold flower, cut	1241B120312	3
Fagron	Marigold flower, cut	1104211448	1
Fagron	Matricaria flower		1
Fagron	Melissa leaves, cut	12032318	3
Fagron	Methadone hydrochloride	13J24-B06-286907	1
Fagron	Methadone hydrochloride	11G11-N02	1
Fagron	Methadone hydrochloride	12H07-N05	4
Fagron	Methadone hydrochloride	1213E-02949	1
Fagron	Methadone hydrochloride	1225H008	1
Fagron	Methadone hydrochloride	9041306	1
Fagron	Methadone hydrochloride	15I24-B07	1
Fagron	Methadone hydrochloride	1608H002	1
Fagron	Methadone hydrochloride	16B16-B02-318420	1
Fagron	Methadone hydrochloride	16B16-B02-318421	1
Fagron	Methadone hydrochloride	25091406	1
Fagron	Methadone hydrochloride	29051502	1
Fagron	Methadone hydrochloride	13F17-N02	4
Fagron	Methadone hydrochloride	414022-1-P	1
Fagron	Methadone hydrochloride	12A05-No2	1
Fagron	Methadone hydrochloride	14C24-B01-292857	4
Fagron	Methadone hydrochloride	14H15-B01-299381	1
Fagron	Methadone hydrochloride	15B24-B02-313097	1
Fagron	Methadone hydrochloride	11D07-N09	1
Fagron	Methadone hydrochloride	1327h051	1
Fagron	Methadone hydrochloride	13J24-B06	1
Fagron	Methadone hydrochloride	25091307	1
Fagron	Methadone hydrochloride	12B21-N03	2
Fagron	Methadone hydrochloride	12b21-n03	1
Fagron	Methadone hydrochloride	12H07-N07	1
Fagron	Methadone hydrochloride	13B06-N02	6
Fagron	Methadone hydrochloride	13J24B06286910	1
Fagron	Methadone hydrochloride	171920-0009	1
Fagron	Methadone hydrochloride	20130912-6	1
Fagron	Methadone hydrochloride	15E29-B02-313098	3
Fagron	Methadone hydrochloride	14H15-B01-299382	4
Fagron	Methadone hydrochloride	1316H037	4
Fagron	Methadone hydrochloride	14H15-B01-299380	1
Fagron	Methadone hydrochloride	14H15-B01	1
Fagron	Methadone hydrochloride	14C24-B01-292862	1
Fagron	Methadone hydrochloride	1437H012	3
Fagron	Methadone hydrochloride	1409H043	1
Fagron	Methadone hydrochloride	4031517	1
Fagron	Methadone hydrochloride	13J24-B06-286908	1
Fagron	Methadone hydrochloride	13I24-B06-286908	1
Fagron	Methadone hydrochloride	8081501	1
Fagron	Methadone hydrochloride	14H15-B01-299386	1
Fagron	Methadone hydrochloride	15B24-B02-304724	5
Fagron	Methadone hydrochloride	15B24-B02-304724	1
Fagron	Methadone hydrochloride	15E29_B02_309070	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Methadone hydrochloride	15E29-B02-309065	1
Fagron	Methadone hydrochloride	15E29-B02-309070	2
Fagron	Methadone hydrochloride	1514H042	2
Fagron	Midazolam hydrochloride	14H05-B08-297982	1
Fagron	Midazolam hydrochloride	13E22-N09	2
Fagron	Midazolam hydrochloride	9D27-N01	2
Fagron	Midazolam hydrochloride	14C19-B04	1
Fagron	Morphine hydrochloride	12E10-N04	2
Fagron	Morphine hydrochloride	15I09-B08-312693	1
Fagron	Morphine hydrochloride	15J27_B01_316889	1
Fagron	Morphine hydrochloride	15A12-B04-303137	1
Fagron	Morphine hydrochloride	11A27-N04	1
Fagron	Morphine hydrochloride	13D09-N04	1
Fagron	Morphine hydrochloride	12E10N04	1
Fagron	Morphine hydrochloride	13H22-N12	1
Fagron	Naloxone hydrochloride	11/23-N01	1
Fagron	Naloxone hydrochloride	12-00071	2
Fagron	Naloxone hydrochloride	12G19-N02	2
Fagron	Naloxone hydrochloride	13H09-N08	1
Fagron	Naloxone hydrochloride	12G19-N02	1
Fagron	Naloxone hydrochloride	13L12-B03-289511	1
Fagron	Naloxone hydrochloride	13D22-N07	3
Fagron	Nettle leaves, cut	12184702	3
Fagron	Nystatin	11K11-No4	1
Fagron	Nystatin	11K11-N04	1
Fagron	Nystatin	11L21-N02	1
Fagron	Nystatin	11C21-N10	1
Fagron	Nystatin	12C29-N09	3
Fagron	Nystatin	12G04-N12	1
Fagron	Nystatin	13C11-N08	1
Fagron	Nystatin	20121202	1
Fagron	Nystatin	4014376	1
Fagron	Pansy herb, cut		1
Fagron	Peppermint leaves, cut	13030803	3
Fagron	Phenobarbital	13G05-N09	2
Fagron	Potassium hydrocarbon...	120801001	1
Fagron	Potassium hydrocarbon...	12K27-N06	2
Fagron	Potassium hydrocarbon...	11/26-N14	1
Fagron	Potassium hydrocarbon...	12C12-N02	2
Fagron	Potassium hydrocarbon...	3413M-01728	1
Fagron	Potassium hydrocarbon...	12141911	1
Fagron	Potassium hydrocarbon...	13031205	1
Fagron	Potassium hydrocarbon...	10G22-N10	1
Fagron	Prednisolone 1:10 (ri...	12D04-N01	1
Fagron	Prednisolone 1:10 (ri...	12L19-N06	1
Fagron	Rhubarb root, powdered	11043821	1
Fagron	Sage leaves, cut	2301A120403	47
Fagron	Senna leaves, cut	314Q1514	1
Fagron	Sodium dihydrogen pho...	12L05-N05	1
Fagron	Sodium hydrogen carbo...	13B12-N01	1
Fagron	Sodium hydrogen carbo...	13B18-N03	5
Fagron	Sodium hydrogen carbo...	11I12-N16	5
Fagron	Sodium hydrogen carbo...	11/12-N16	2
Fagron	Sodium hydrogen carbo...	RBA3421100	6
Fagron	Sodium hydrogen carbo...	12D11N02	2
Fagron	Sodium hydrogen carbo...	11e31-n04	1
Fagron	Sodium hydrogen carbo...	13G11-N03	3
Fagron	Sodium hydrogen carbo...	4413I01892	1
Fagron	Sodium hydrogen carbo...	12G11-N03	8
Fagron	Sodium hydrogen carbo...	12D11-No2	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fagron	Sodium hydrogen carbo...	12D11-N02	2
Fagron	Sodium hydrogen carbo...	RBA0021100	1
Fagron	Sodium hydrogen carbo...	RBA1661100	1
Fagron	Sodium hydrogen carbo...	12B06-N01	3
Fagron	Sodium hydrogen carbo...	RBA3631200	1
Fagron	Sodium hydrogen carbo...	RBA3651200	2
Fagron	Sodium hydrogen carbo...	11K25-N05	4
Fagron	Sodium hydrogen carbo...	13D29-N09	5
Fagron	Sodium hydroxide pell...	13F06-N02	3
Fagron	Sodium hydroxide pell...	12E02-N15	1
Fagron	Sodium hydroxide pell...	13k22-no5	1
Fagron	Sodium monohydrogenph...	11K07-N10	1
Fagron	Sodium monohydrogenph...	12H21-N03	1
Fagron	Sodium monohydrogenph...	613I-01914	1
Fagron	Sodium monohydrogenph...	13H01-B01	1
Fagron	Sodium monohydrogenph...	13D24-N12	2
Fagron	Sodium monohydrogenph...	B44888A	2
Fagron	Sodium monohydrogenph...	2111E-01914	1
Fagron	Sodium monohydrogenph...	1513I-01914	1
Fagron	Sodium monohydrogenph...	11K30-N01	1
Fagron	Sodium sulfate decahy...	2134	2
Fagron	Sodium sulfate decahy...	1464	1
Fagron	Sodium sulfate decahy...	12E30-N09	1
Fagron	Sodium sulfate decahy...	12H31-N04	2
Fagron	Sodium sulfate decahy...	11H01-N06	1
Fagron	Sodium thiosulfate pe...	3313U-01922	1
Fagron	Sodium thiosulfate pe...	12F20-N20	1
Fagron	Sodium thiosulfate pe...	12F20-N10	1
Fagron	Sodium thiosulfate pe...	14A28-B08-290696	1
Fagron	Sulfanilamide	11L01-No8	1
Fagron	Thiomersal	12C08-N02	1
Fagron	Thiomersal	13E22-N13	1
Fagron	Thiomersal	12F19-N11	1
Fagron	Triamcinolone acetoni...	12G23-N06	3
Fagron	Triamcinolone acetoni...	12I07-N04	1
Fagron	Triamcinolone acetoni...	12E23-N01	4
Fagron	Triamcinolone acetoni...	12I07-N04022/359	1
Fagron	Triamcinolone acetoni...	11G14-N02	1
Fagron	Triamcinolone acetoni...	13F20-N010113/150	1
Fagron	Triamcinolone acetoni...	13F21-N01	2
Fagron	Triamcinolone acetoni...	12I07-N04	1
Fagron	Triamcinolone acetoni...	12I07-No4	1
Fagron	Tricalcium phosphate	12G10-N05	1
Fagron	Tricalcium phosphate	12I13-N03	1
Fagron	Trichloroacetic acid	10379405	1
Fagron	Trichloroacetic acid	13H22-M04	1
Fagron	Trichloroacetic acid	13B19-M04	1
Fagron	Valerian root, cut	12033809	11
Fagron	Yarrow herb, cut	3613M-0165	1
Falcento	D-(+)-mannose	R-4638	1
Falcento	D-(+)-mannose	R4640	1
Falcento	D-(+)-mannose	R-4641	1
Falcento	D-(+)-mannose	R-4639	2
Falcento	D-ribose	201206712	2
Falcento	D-ribose	JXCZSJ14-D-010	1
Falcento	D-ribose	201209702	1
fargon	Magnesium sulfate hep...	12E22-N02	4
Fargon	Heavy alkaline bismut...	11C10-N06	1
Fargon	Hydromorphone hydroch...	13127-N05	1
FARGON	Aluminium chloride he...	13d22-n09	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Fargon/17.07.2013/Now...	Triamcinolone acetoni...	12 07-N04	1
Fargron/Noweda	Sweet fennel	2870A150810	1
Fiebig	Aluminium chloride he...	11J06-N03	1
Fiebig	Dandelion herb with r...	11003313	1
Fiebig	Deadnettle herb with ...	11371710	3
Fiebig	Frankincense granules	10349213	3
Fiebig	Ginkgo leaves, cut	13340902	1
Fiebig	Ginkgo leaves, cut	12373604	4
Fiebig	Mistletoe herb, cut	10273406	1
Fiebig 05.11.12 ek:9...	Bilberry fruit, dried	2910A120410	2
Fiebig 14.02.13 ek:3...	Melilot herb, cut	12231701	3
Finze	Clubmoss herb, cut	9378803	1
Finze	Common centaury, cut	11097610	3
Finze	Common knotgrass herb...	10237202	1
Finze	Elder flower, rubbed	9297415	3
Finze	Flaxseeds	3607E-02240	1
Finze	Horsetail herbs, cut	11076305	10
Finze	Matricaria flower	1290B101122	1
Finze	Sodium hydrogen carbo...	Pr.Nr.4311Q-01892	1
Finze	Speedwell wort, cut	4661B110121	2
Finze	Speedwell wort, cut	4661B080915	1
Finze	St. John's wort, cut	9297303	1
Finze	Wild thyme herb, cut	11031204	1
fischar	Sodium hydrogen carbo...	6522101	5
Fischar	Copper (II) sulfate p...	9452011	1
Fischar	Sodium hydrogen carbo...	6521111	9
fragon	Sodium sulfate decahy...		1
Gahlke	Anise, crushed	21401	1
Gahlke	Bitter fennel	20362	1
Gahlke	Frankincense granules	21949	1
Gahlke	Sorrel herbs, cut	21479	1
Gahlke	Woodruff herb, cut	22100	1
galke	Anise	19654	1
galke	Bitter fennel	19938	3
galke	Cudweed flower, cut	nachprüfung	1
galke	Matricaria flower	18471	6
galke	Melissa leaves, cut	20867	1
galke	Nettle leaves, cut	21639	1
Galke	Agrimony herb, cut	2002	1
Galke	Anise	21278	1
Galke	Anise	22274	1
Galke	Anise	23464	1
Galke	Asparagus rhizome, cut	20178	1
Galke	Bean-pods, cut	21219	1
Galke	Bearberry leaves, cut	19936	3
Galke	Birch leaves, cut	21226	1
Galke	Birch leaves, cut	20904	1
Galke	Bitter fennel	22176	1
Galke	Blackcurrants	21348	1
Galke	Boldo leaves, cut	19855	1
Galke	Burdock root, cut	19802	1
Galke	Caraway	23627	1
Galke	Caraway	21257	1
Galke	Caraway, crushed	18943	1
Galke	Clubmoss herb, cut	16913	2
Galke	Colewort, cut	20881	1
Galke	Common broom herb, cut	12358803	4
Galke	Common broom herb, cut	21610	1
Galke	Common centaury, cut	9721	1
Galke	Cornflower flower wit...	23131	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Galke	Couchgrass root rhizo...	18781	1
Galke	Curcuma rhizome, cut	20184	1
Galke	Curcuma rhizome, cut	23123	1
Galke	Dandelion herb with r...	22093	2
Galke	Dandelion herb with r...	20531	6
Galke	Dandelion root, cut	126302	1
Galke	Dandelion root, cut	20658	1
Galke	Deadnettle flower	21691	4
Galke	Deadnettle flower	22704	1
Galke	Deadnettle herb with ...	19706	1
Galke	Deadnettle herb with ...	22253	2
Galke	Devil's claw root	20282	2
Galke	Devil's claw root	21018	2
Galke	Dill seeds	22422	4
Galke	Elder flower, rubbed	21934	1
Galke	Elfwort root, cut	21569	2
Galke	Eyebright herb, cut	20262	2
Galke	Flohsamen	20968	2
Galke	Flohsamen	22989	7
Galke	Gentian root, cut	19192	2
Galke	Genuine cleaver's her...	21942	2
Galke	Ginger rhizome, peeled	21766	2
Galke	Ginger rhizome, peeled	20633	1
Galke	Goat's rue herb, cut	8378	2
Galke	Golden rot wort, cut	21079	2
Galke	Hawthorn leaves with ...	21126	3
Galke	Hay flowers	21926	1
Galke	Hop strobile	20928	3
Galke	Hop strobile	20928	2
Galke	Hop strobile	23363	1
Galke	Horse chestnut flower...	2614	1
Galke	Horsetail herbs, cut	22061	1
Galke	Horsetail herbs, cut	19663	3
Galke	Hyssop herb, cut	20939	1
Galke	Iceland moss, cut	12369	1
Galke	Javanese curcuma root...	15540	1
Galke	Javanese curcuma root...	15540	1
Galke	Lady's mantle herb, cut	19835	1
Galke	Lady's mantle herb, cut	21141	1
Galke	Lady's mantle herb, cut	22291	1
Galke	Lavender flower	21416	2
Galke	Lemon peel, cut	22975	1
Galke	Lungwort herb, cut	19511	4
Galke	Mallow flower, cut	21119	1
Galke	Mallow leaves, cut	21445	1
Galke	Mallow leaves, cut	17133	1
Galke	Mallow leaves, cut	21454	1
Galke	Manna, powdered	19784	1
Galke	Manna, powdered	20669	1
Galke	Marian thistle fruit	22187	4
Galke	Marjoram herb, rubbed	23241	1
Galke	Marjoram herb, rubbed	22401	1
Galke	Masterwort rhizome, cut	18411	1
Galke	Masterwort rhizome, cut	23074	1
Galke	Mate leaves, cut	22365	1
Galke	Matricaria flower	18803	1
Galke	Matricaria flower	21652	1
Galke	Meadowsweet herb, cut	20358	1
Galke	Mistletoe herb, cut	22012	2
Galke	Mistletoe herb, cut	20328	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Galke	Mugwort herb, cut	21637	1
Galke	Nettle leaves, cut	23302	1
Galke	Nettle leaves, cut	21238	1
Galke	Nettle leaves, cut	20956	1
Galke	Nutmeg, powdered (spi. ...)	22739	1
Galke	Oak bark, cut	17824	2
Galke	Peppermint leaves, cut	22783	3
Galke	Peppermint leaves, cut	20975	3
Galke	Peppermint leaves, cut	22218	1
Galke	Plantain leaves, cut	21598	1
Galke	Plantain leaves, cut	20259	1
Galke	Plantain leaves, cut	20832	1
Galke	Primrose flower	22612	2
Galke	Raspberry leaves, cut	18060	2
Galke	Raspberry leaves, cut	23532	1
Galke	Raspberry leaves, cut	21244	1
Galke	Raspberry leaves, cut	19499	2
Galke	Red clover flower	23128	2
Galke	Rose flower	22641	2
Galke	Rosemary leaves, cut	22777	1
Galke	Rosemary leaves, cut	21390	1
Galke	Rosemary leaves, cut	19813	1
Galke	Sage leaves, cut	21015	3
Galke	Sanicle herb, cut	23097	1
Galke	Senna leaves, cut	21778	1
Galke	Shepherd's purse herb. ...	21719	2
Galke	Shepherd's purse herb. ...	19483	1
Galke	Silverweed, cut	12891	2
Galke	St. John's wort, cut	21990	4
Galke	St. John's wort, cut	21034	1
Galke	St. John's wort, cut	21556	1
Galke	St. John's wort, cut	23054	1
Galke	Thyme, rubbed	28719	1
Galke	Thyme, rubbed	1833	1
Galke	Thyme, rubbed	20719	2
Galke	Thyme, rubbed	19386	2
Galke	Tormentil rhizome	21091	1
Galke	Tormentil rhizome	21744	2
Galke	Valerian root, cut	22070	1
Galke	Valerian root, cut	21798	2
Galke	Violet root	21303	1
Galke	Walnut leaves, cut	21061	1
Galke	Willow bark, cut	20338	1
Galke	Willowherb, small-flo. ...	47502	1
Galke	Willowherb, small-flo. ...	22347	3
Galke	Wormwood herb, cut	21330	1
Galke	Yarrow herb, cut	22048	7
Galke	Yarrow herb, cut	23735	1
Galke	Yarrow herb, cut	21295	2
Galke	Yarrow herb, cut	23318	1
galke,	Lime flower, cut	2098	1
galke,	Marigold flower witho. ...	12028	1
gasser	Angelica root	950049	1
Gatt Koller/Herba	Amphetamine sulfate	942/03130814	1
gebepharm	Sodium monohydrogenph. ...	20160909-2	1
gehe	Cinnamon bark, cut	13304412	1
gehe	Monk's pepper fruit	13193407	1
Gehe	Aluminium chloride he. ...	12/27-No1	1
Gehe	Aluminium chloride he. ...	12114902	5
Gehe	Aluminium chloride he. ...	12/27-n01	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Aluminium chloride he...	130701102	1
Gehe	Aluminium chloride he...	1204026-01	28
Gehe	Angelica root	269740	2
Gehe	Angelica root	285732	1
Gehe	Anise, crushed	13149903	1
Gehe	Barberries	2720N111109	1
Gehe	Betamethasone-17-vale...	12G02-N02	4
Gehe	Betamethasone-17-vale...	12C19-N07	3
Gehe	Birch leaves, cut	264603	2
Gehe	Bitter fennel	12035102	3
Gehe	Blackberry leaves, cut	10136409	2
Gehe	Calamus rhizome, peeled	6701B130807	9
Gehe	Calcium hydroxide	12F08-N02	3
Gehe	Chickweed herb, cut	10359112	1
Gehe	Chicory herb, cut	10325608	1
Gehe	Clobetasol-17-propion...	12/19-N01	2
Gehe	Clobetasol-17-propion...	1109D005	1
Gehe	Clubmoss herb, cut	521103845	1
Gehe	Codeine phosphate hem...	15350710	1
Gehe	Coltsfoot leaves, cut	269261	2
Gehe	Couchgrass root rhizo...	283061	1
Gehe	Couchgrass root rhizo...	12186704	1
Gehe	Dandelion herb with r...	266855	1
Gehe	Dandelion herb with r...	6611B110104	1
Gehe	Dandelion herb with r...	13019803	1
Gehe	Dandelion herb with r...	6611B120620	29
Gehe	Dandelion herb withou...	4591C111010	2
Gehe	Deadnettle flower	3915-091	1
Gehe	Devil's claw root	1114005	1
Gehe	Dexamethasone 1:10 (r...	12E30-N16	1
Gehe	Dill seeds	2680A121211	4
Gehe	Elderberries	12267807	1
Gehe	Fenugreek seeds	13013811	2
Gehe	Frangula bark, cut	11254006	6
Gehe	Frangula bark, cut	11254003	2
Gehe	Frangula bark, cut	11254004	7
Gehe	Frankincense granules	12120002	1
Gehe	Fumitory herb, cut	13202907	1
Gehe	Golden rot wort, cut	11207011	2
Gehe	Hawthorn leaves with ...	1351B111207	2
Gehe	Hemp nettle herb, cut	3911A130320	6
Gehe	Horse chestnut leaves...	2551B131024	1
Gehe	Horsetail herbs, cut	10375515	1
Gehe	Horsetail herbs, cut	12288803	14
Gehe	Iceland moss, cut	11053915	1
Gehe	Iceland moss, cut	11101603	2
Gehe	Iceland moss, cut	11101605	2
Gehe	Iceland moss, cut	13350805	6
Gehe	Iceland moss, cut	5191A130116	2
Gehe	Ivy leaves, cut	11229501	1
Gehe	Lady's mantle herb, cut	1341102	1
Gehe	Liquorice root, peeled	268835	2
Gehe	Liquorice root, unpee...	277004	2
Gehe	Liquorice root, unpee...	283316	1
Gehe	Mallow leaves, cut	10290512	2
Gehe	Marigold flower witho...	13235502	2
Gehe	Marigold flower, cut	260205	1
Gehe	Marigold flower, cut	266676	1
Gehe	Marjoram herb, rubbed	4881A100929	4
Gehe	Marshmallow root, pee...	6071A120306	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Gehe	Matricaria flower	12337605	1
Gehe	Matricaria flower	281103	4
Gehe	Matricaria flower	11255204	1
Gehe	Matricaria flower	276095	10
Gehe	Matricaria flower	270579	1
Gehe	Matricaria flower	268408	2
Gehe	Matricaria flower	12133009	1
Gehe	Matricaria flower	265419	4
Gehe	Melilot herb, cut	110324	1
Gehe	Mistletoe herb, cut	264539	1
Gehe	Motherwort herb, cut	12231502	2
Gehe	Nettle leaves, cut	10162701	1
Gehe	Nettle root, cut	6631B120927	14
Gehe	Parsley herb, rubbed	10269905	1
Gehe	Peppermint leaves, cut	2161A121029	16
Gehe	Peppermint leaves, cut	2181B130717A	1
Gehe	Peppermint leaves, cut	2181B130717B	1
Gehe	Primrose flower	11374401	1
Gehe	Rhubarb root, cut	11057817	6
Gehe	Rhubarb root, cut	13235208	2
Gehe	Rosehip	2840A120719	1
Gehe	Rue herb, cut	12148802	1
Gehe	Sage leaves, cut	275598	5
Gehe	Sage leaves, cut	269030	6
Gehe	Sage leaves, cut	277580	7
Gehe	Sage leaves, cut	265630	4
Gehe	Shepherd's purse herb...	11036410	2
Gehe	Silverweed, cut	11328101	1
Gehe	Sodium hydrogen carbo...	11078315	1
Gehe	Sodium monohydrogenph...	12109001	2
Gehe	St. John's wort, cut	9297305	1
Gehe	St. John's wort, cut	259604	1
Gehe	St. John's wort, cut	11185602	1
Gehe	Thyme, rubbed	4622A110120	1
Gehe	Triamcinolone acetoni...	12A05-N07	4
Gehe	Triamcinolone acetoni...	13A15-N05	2
Gehe	Walnut leaves, cut	10050412	1
Gehe	Walnut leaves, cut	211A120123	1
Gehe	Walnut leaves, cut	2111B151028	1
Gehe	Walnut shells, cut	1135602	1
Gehe	Wood betony herb, cut	12007201	2
Gehe	Wormwood herb, cut	13381901	1
Gehe	Yarrow flower, rubbed	12267702	2
Gehe	Yarrow herb, cut	1128503	1
GEHE	Dexamphetamine sulfate	12F11-N01	1
GEHE	Dexamphetamine sulfate	635JFA70029	2
GEHE	Dexamphetamine sulfate	635J7FA70021	1
GEHE	Hawthorn leaves with ...	1971A120215	8
GEHE	Horsetail herbs, cut	270045	1
GEHE	Raspberry leaves, cut	272989	1
GEHE	Rhubarb root, cut	11321802	1
GEHE	St. John's wort, cut	2477580	1
GEHE	Thyme, rubbed	521205633	1
GEHE	Trichloroacetic acid	10379406	2
GEHE	Walnut leaves, cut	21022101/1	1
GEHE	Yarrow herb, cut	11280514	4
Gehe / 08.03.13 Redwood	Blessed thistle herb,...	205007	1
Gehe 02.07.2013	Raspberry leaves, cut	11030701	1
Gehe 06.05.2013	Matricaria flower	11169606	1
Gehe 06.08.2013	Raspberry leaves, cut	10013411	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
gehe 07.12.2013	Sage leaves, cut	2301/7120403	1
Gehe 08.07.2013	Anise	1303780L	1
Gehe 09.03.13	Plantain herb, cut	12374104	9
GEHE 10.03.2014	Oak bark, cut	761A11816	1
Gehe 10.05.2013	Raspberry leaves, cut	2291A120507	9
gehe 10.12.13	Raspberry leaves, cut	229117121120	1
Gehe 12.04.2013	Fenugreek seeds	12252602	4
Gehe 12.04.2013	Juniper berries, crus...	13020903	2
Gehe 12.04.2013	Tricalcium phosphate	12/13.N03	1
Gehe 15.05.2013	Peppermint leaves, cut	2161A120718	3
Gehe 15.07.2013	Aluminium chloride he...	13022N09	1
Gehe 18.12.12	Dandelion root, cut	11003313	2
gehe 20.11.13	Fumitory herb, cut	3881B111013	2
Gehe 21.05.2013	Angelica root	278757	7
Gehe 21.05.2013	Tormentil rhizome	12040713	2
gehe 21.08.2013	Nettle root, cut	11265004	5
Gehe 28.03.2013	Aluminium potassium s...	12184406	3
Gehe 28.12.12	Tetterwort, cut	3731A120611	5
Gehe am 14.01.2013	Eyebright herb, cut	270726	1
Gehe am 27.03.2014	Juniper berries, crus...	2890A130513	1
gehe, 09.01.2013	Elder flower, rubbed	1571A1202015	2
gehe, 11.01.2013	Mistletoe herb, cut	11294001	1
Gehe08.06.2013	Senna leaves, cut	2331-B-130241	2
Großhandel	Angelica root	272721	1
Großhandel	Bitter almonds	40A100901	1
Großhandel	Bitter orange flower ...	12266606	1
Großhandel	Bitter orange flower ...	11049213	1
Großhandel	Bitter orange flower ...	12266602	3
Großhandel	Bitter orange flower ...	12266612	1
Großhandel	Bitter orange flower ...	12266610	1
Großhandel	Bitter orange flower ...	12266607	1
Großhandel	Golden rot wort, cut	11280311	4
Großhandel	Magnesium chloride he...	12141807	3
Großhandel	Mallow flower, cut	1501B111215	2
Großhandel	Matricaria flower	1290A120403	4
Großhandel	Nutmeg	7320A110825	1
Großhandel	Nutmeg	7320A130911	1
Großhandel	Nystatin	12158010	7
Großhandel	Passionflower herb, cut	12031706	4
Großhandel	Siberien ginseng root...	10381816	1
Großhandel	Thyme, rubbed	4622A12011	1
Gutenberg-Apotheke	Anise	1333902	1
Gutenberg-Apotheke	Barberries	12217109	4
Gutenberg-Apotheke	Elderberries	3010N120921	3
Gutenberg-Apotheke	Monk's pepper fruit	61765	1
Gutenberg-Apotheke	Nettle leaves, cut	18897	1
Gutenberg-Apotheke	Raspberry leaves, cut	28911	1
Haustee	Mistletoe herb, cut	57010507	1
Hedinger	Dandelion herb with r...	10121614	1
Hedinger	Magnesium sulfate hep...	204037	1
Hedinger	Magnesium sulfate hep...	204035	4
Hedinger	Rhubarb root, powdered	13193110	1
Hedinger/Phönix	Sodium sulfate decahy...	205025	2
hepart ag	Inositol hexanicotinate	63501	1
Hepart AG	Anise	B216346, kbA	1
Hepart AG	Bitter fennel	B492, kbA	1
Hepart AG	Bitter orange flower ...	B120822	1
Hepart AG	Black cumin seed	20720, kbA	1
Hepart AG	Blackthorn flower, ru...	N101109	2
Hepart AG	Caraway	B-224, kbA	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Hepart AG	Daisies	A130307	1
Hepart AG	Dill seeds	L30057kbA	1
Hepart AG	Fenugreek seeds	A120118	2
Hepart AG	Hawthorn flower	13010401	1
Hepart AG	Herb Robert, cut	A110621	6
Hepart AG	Horsetail herbs, cut	B-695, kbA	1
Hepart AG	Lady's mantle herb, cut	21963	2
Hepart AG	Lady's mantle herb, cut	B-698kbA	1
Hepart AG	Lavender flower	A130214	4
Hepart AG	Matricaria flower	B-477, kbA	1
Hepart AG	Melilot herb, cut	A110324	6
Hepart AG	Mullein flower, cut	12170904	3
Hepart AG	Nettle leaves, cut	P234605kbA	1
Hepart AG	Primrose flower	11374403	3
Hepart AG	Primrose flower	13086602	5
Hepart AG	Restharrow root, cut	B130404	3
Hepart AG	Savory mountain type,...	12177205	3
Hepart AG	Southernwood root	B120726	1
Hepart AG	Speedwell wort, cut	C130226	5
Hepart AG	St. John's wort, cut	B-445, kbA	1
Hepart AG	Thyme, rubbed	A130109	2
Hepart AG	Walnut leaves, cut	A120123	1
Hepart AG	Willow bark, cut	B100910	6
Hepart AG	Willowherb, small-flo...	10326110	2
Herbasinica	Agrimony herb, cut	11374007	1
Herbasinica	Aluminium chloride he...	11G05-N02	3
Herbasinica	Bitter fennel	1294710	1
Herbasinica	Black cohosh rhizome,...	nachprüfung	1
Herbasinica	Blackthorn flower	nachprüfung	1
Herbasinica	Chickweed herb, cut	nachprüfung	2
Herbasinica	Cornflower flower wit...	nachprüfung	1
Herbasinica	Heavy alkaline bismut...	nachprüfung	1
Herbasinica	Hollyhock flower, cut	nachprüfung	1
Herbasinica	Lavender flower	nachprüfung	1
Herbasinica	Lavender flower	1488A130830	1
Herbasinica	Magnesium sulfate hep...	1303008-01	6
Herbasinica	Marian thistle fruit	nachprüfung	1
Herbasinica	Meadowsweet herb, cut	10381604	11
Herbasinica	Potassium hydroxide	11165708	2
Herbasinica	Primrose flower	nachprüfung	1
Herbasinica	Rose flower leaves, cut	nachprüfung	1
Herbasinica	Sodium hydrogen carbo...	12324704	5
Herbasinica	Tormentil rhizome	nachprüfung	3
Hersteller: EuRho	Nystatin	1107036-01	8
Hersteller: Klenf	Coltsfoot leaves, cut	2021B120124	7
himb	Birch leaves, cut	12193104	2
HiperScan	Peppermint leaves, cut		2
Hof-Apotheke, St. Afra	Comfrey root	125041	1
Hofmann Sommer	Mate leaves, cut	2141a111213	3
Hofmann Sommer	Willowherb, small-flo...	13200203	4
Holdermann	Fuchsine	11K18-N02	1
Holdermann	Tormentil rhizome	12040708	11
holdermann euro	Potassium hydrocarbon...	1303002-01	4
Hollborn	Bromothymol blue	III13	1
Ichthyol	Calamus rhizome, peeled	272703	1
Ichthyol/Phoenix	Fenugreek seeds, powd...	14377205	1
ICHTHYOL-GESELLSCHAFT	Sodium monohydrogenph...	Caelo	1
Ichthyol/Phönix	Lady's mantle herb, cut	13141107	5
Ichthyol/Phönix	Zinc orotate dihydrate	12B02-N02	1
Jenne	Anise	2700A131015	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Jenne	Kaolin, heavy	13041803	3
Jenne	Methadone hydrochloride	15B24-B02	1
JENNE	Milkvetch, powdered	16110801	1
Jinzhou Donghui Phar...	Dimercaptosuccinic acid	121115	1
Kehr	Mallow flower, cut	10357908	3
Kehr	Mullein flower, cut	11020901	1
Kehr	Sodium monohydrogenph...	11K30-N01	2
Kehr	Southernwood root	6191B1111205	1
Kehr	Zedoary rhizome, cut	12125301	5
Kenk / Phoenix	Daisies	1210A130307	3
Kenk / Phoenix	Dandelion herb with r...	6611B130321	25
Kenk / Phoenix	Frangula bark, cut	661B110412	4
Kenk / Phoenix	Genuine golden rot wo...	1781B110826	1
Kenk / Phoenix	Hawthorn leaves with ...	1971A130307	4
Kenk / Phoenix	Hop strobile	1451B130409	8
Kenk / Phoenix	Javanese curcuma root...	6731B130117	1
Kenk / Phoenix	Lapacho bark, cut	5161A110204	1
Kenk / Phoenix	Lavender flower	1489A130214	12
Kenk / Phoenix	Lavender flower	1489A120103	24
Kenk / Phoenix	Marian thistle herb, ...	3701B120717	3
Kenk / Phoenix	Marigold flower, cut	1241B130517	5
Kenk / Phoenix	Melilot herb, cut	4151A110324	7
Kenk / Phoenix	Raspberry leaves, cut	22781C120508	1
Kenk / Phoenix	Rosehip	2841B111019	3
Kenk / Phoenix	Sage leaves, cut	2301A130904	1
Kenk / Phoenix	St. John's wort, cut	4021A120604	22
Kle	Dill seeds	2680A110204	1
Klenk	Agarikon	1061a120312	1
Klenk	Agrimony herb, cut	3481C120508	1
Klenk	Angelica root	6081B130726	1
Klenk	Angelica root	6081B150701	1
Klenk	Angelica root	6085B120614	1
Klenk	Angelica root	6081B130109	1
Klenk	Angelica root	B130109	2
Klenk	Angelica root	6091B130109	1
Klenk	Angelica root	6081B130410	3
Klenk	Angelica root	6081N120110	18
Klenk	Angelica root	6081b130109	2
Klenk	Angelica root	6081N100618	3
Klenk	Angelica root	6081n120110	1
Klenk	Angelica root	6082b130410	1
Klenk	Angelica root	6081B130109	7
Klenk	Anise	2700A110701	10
Klenk	Anise	2103311530	1
Klenk	Anise	1601211530	1
Klenk	Anise	814Q01530	1
Klenk	Anise	212M-01530	1
Klenk	Anise	nachprüfung	1
Klenk	Anise	2700A-110701	1
Klenk	Anise	2700a120320	1
Klenk	Anise	3113Q01530	1
Klenk	Anise	2901311530	1
Klenk	Anise	2700A150601	1
Klenk	Anise	2700A120320	13
Klenk	Anise	2700A12107	1
Klenk	Anise, crushed	2706B100120	1
Klenk	Apple pieces, cut	A120302	2
Klenk	Arnica flower	1181B130605	1
Klenk	Artichoke leaves, cut	1981B120413	1
Klenk	Artichoke leaves, cut	B121025	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Artichoke leaves, cut	1981B130111	3
Klenk	Artichoke leaves, cut	1981B121025	4
Klenk	Ash leaves, cut	5111A-01491	1
Klenk	Barberry bark, cut	551B120320	1
Klenk	Barberry bark, cut	551B110128	6
Klenk	Basil herb, rubbed	3632A120502	5
Klenk	Basil herb, rubbed	3632a120502	1
Klenk	Basil herb, rubbed	A110201	1
Klenk	Basil herb, rubbed	A120502	1
Klenk	Bay leaves	B110809	1
Klenk	Bay leaves, cut	B110809	2
Klenk	Bean-pods, cut	C130620	1
Klenk	Bean-pods, cut	11030602	6
Klenk	Bean-pods, cut	671A100816	2
Klenk	Bean-pods, cut	671A110420	12
Klenk	Bean-pods, cut	171A110301	1
Klenk	Bean-pods, cut	C120321	2
Klenk	Bean-pods, cut	671C130620	5
Klenk	Bean-pods, cut	671A100420	1
Klenk	Bean-pods, cut	671C121105	7
Klenk	Bean-pods, cut	671A-110420	1
Klenk	Bean-pods, cut	671C120321	16
Klenk	Bean-pods, cut	C121105	2
Klenk	Bean-pods, cut	671A110301	1
Klenk	Bearberry leaves, cut	2391B130328	7
Klenk	Bearberry leaves, cut	2391B07030901	1
Klenk	Bearberry leaves, cut	2391B120719	13
Klenk	Bearberry leaves, cut	2391B120314	9
Klenk	Bearberry leaves, cut	23051202	1
Klenk	Bearberry leaves, cut	2391b120314	2
Klenk	Bilberry fruit, dried	2010N110304	1
Klenk	Bilberry fruit, dried	2910A090717	2
Klenk	Bilberry fruit, dried	2910N120921	3
Klenk	Bilberry fruit, dried	2910N121022	8
Klenk	Bilberry fruit, dried	N130131	2
Klenk	Bilberry fruit, dried	N121022	1
Klenk	Bilberry fruit, dried	910N130131	2
Klenk	Bilberry fruit, dried	2910n130131	1
Klenk	Bilberry fruit, dried	2910N130131	11
Klenk	Bilberry fruit, dried	2910n120921	1
Klenk	Bilberry fruit, dried	2910n110304	1
Klenk	Bilberry fruit, dried	2910N110304	4
Klenk	Bilberry leaves, cut	N110516	1
Klenk	Bilberry leaves, cut	2191N110516	5
Klenk	Bilberry leaves, cut	4042013	1
Klenk	Birch leaves, cut	19121206	1
Klenk	Birch leaves, cut	1901c120802	1
Klenk	Birch leaves, cut	21061303	1
Klenk	Birch leaves, cut	27121301	1
Klenk	Birch leaves, cut	28101306	1
Klenk	Birch leaves, cut	20111201	1
Klenk	Birch leaves, cut	F-040413-1	1
Klenk	Birch leaves, cut	C120802	1
Klenk	Birch leaves, cut	A121130	2
Klenk	Birch leaves, cut	4213I01481	1
Klenk	Birch leaves, cut	4113A-01481	1
Klenk	Birch leaves, cut	1901C-120508	1
Klenk	Birch leaves, cut	1901C120508	21
Klenk	Birch leaves, cut	1901A110726	25
Klenk	Birch leaves, cut	1901A-110726	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Birch leaves, cut	1901c120508	3
Klenk	Birch leaves, cut	4021409	1
Klenk	Birch leaves, cut	1901A121130	26
Klenk	Birch leaves, cut	1901C120802	18
Klenk	Birch leaves, cut	1901A05051801	1
Klenk	Birch leaves, cut	1901A130218	4
Klenk	Birch leaves, cut	1901A130318	2
Klenk	Birch leaves, cut	1901A140214	1
Klenk	Bitter almonds	40A111004	1
Klenk	Bitter almonds	40A161028	1
Klenk	Bitter almonds	40A111117	8
Klenk	Bitter almonds	40A120924	8
Klenk	Bitter almonds	40A140908	14
Klenk	Bitter almonds	40A150904	3
Klenk	Bitter almonds	40A130909	10
Klenk	Bitter almonds	40A0130909	1
Klenk	Bitter fennel	2860A140224	1
Klenk	Bitter fennel	2860, A150617	1
Klenk	Bitter fennel	2866B100211	1
Klenk	Bitter fennel	2866B110318	1
Klenk	Bitter fennel	2860A140613	1
Klenk	Bitter fennel	2860A13	1
Klenk	Bitter fennel	2860A140224	2
Klenk	Bitter fennel	3812A-01545	1
Klenk	Bitter fennel	2880N120418	4
Klenk	Bitter fennel	2866B130206	1
Klenk	Bitter fennel	2880A100503	2
Klenk	Bitter fennel	2860a120412	3
Klenk	Bitter fennel	2860A130513	2
Klenk	Bitter fennel	2860A130226	9
Klenk	Bitter fennel	2860A150320	1
Klenk	Bitter fennel	2860A120412	27
Klenk	Bitter orange flower ...	1201B120822	1
Klenk	Bitter orange flower ...	3613m-01445	1
Klenk	Bitter orange flower ...	1201B110809	1
Klenk	Bitter orange peel, cut	274240	4
Klenk	Bitter orange peel, cut	511B110321	2
Klenk	Bitter orange peel, cut	511B120830	3
Klenk	Bitter orange peel, cut	2711B111207	1
Klenk	Bitter orange peel, cut	531A091125	1
Klenk	Bittersweet stalks, cut	5601A080513	1
Klenk	Black cohosh rhizome,...	3794377	1
Klenk	Black cohosh rhizome,...	6721b130528	1
Klenk	Black cohosh rhizome,...	6721B130528	5
Klenk	Black cohosh rhizome,...	B130528	2
Klenk	Black cohosh rhizome,...	6721B130214	10
Klenk	Black cohosh rhizome,...	6721B081208	1
Klenk	Black cumin seed	A120703	1
Klenk	Black cumin seed	7330A120703	1
Klenk	Black mustard seed	7430A120813	2
Klenk	Black mustard seed, p...	A130422	1
Klenk	Black mustard seed, p...	7434A140923	1
Klenk	Black mustard seed, p...	7434A130422	3
Klenk	Black mustard seed, p...	7434A120712	1
Klenk	Black pepper	A130415	2
Klenk	Blackberry leaves, cut	101364009	1
Klenk	Blackberry leaves, cut	2271B111216	1
Klenk	Blackcurrant leaves, ...	2251a110204	1
Klenk	Blackcurrants	A121106	1
Klenk	Blackcurrants	2990A110620	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Blackthorn flower	2612E-01468	1
Klenk	Blackthorn flower, ru...	1150n101109	1
Klenk	Blackthorn flower, ru...	1150N101109	3
Klenk	Blessed thistle herb,...	A110517	1
Klenk	Blessed thistle herb,...	nachprüfung	1
Klenk	Blueweed root, cut	6221N130201	1
Klenk	Blueweed root, cut	66221A101202	1
Klenk	Blueweed root, cut	A130304	1
Klenk	Blueweed root, cut	6221A090311	2
Klenk	Blueweed root, cut	6221A101202	6
Klenk	Bogbean leaves, cut	2371A100915	1
Klenk	Bogbean leaves, cut	2371A110809	3
Klenk	Boldo leaves, cut	1911B090709	1
Klenk	Boldo leaves, cut	1911A100714	7
Klenk	Buckwheat herb, cut	B120509	1
Klenk	Buckwheat herb, cut	4581B120509	1
Klenk	Burdock root, cut	6161A101206	3
Klenk	Burdock root, cut	6161A120208	2
Klenk	Burdock root, cut	A130214	1
Klenk	Burdock root, cut	6161A-120103	1
Klenk	Burdock root, cut	A120206	1
Klenk	Burdock root, cut	6161a120103	1
Klenk	Calamus rhizome, peeled	6701b120301	1
Klenk	Calamus rhizome, peeled	6701B130103	9
Klenk	Calamus rhizome, peeled	6701B120301	3
Klenk	Calamus rhizome, peeled	6711B110606	1
Klenk	Calamus rhizome, peeled	6701B150407	1
Klenk	Calamus rhizome, peeled	106212173	1
Klenk	Calamus rhizome, peeled	6701b130103	1
Klenk	Caraway	3712I-1537	1
Klenk	Caraway	2770A130521	11
Klenk	Caraway	412091-1-P	1
Klenk	Caraway	5213A1537	1
Klenk	Caraway	nachprüfung	2
Klenk	Caraway	A120905	3
Klenk	Caraway	2770A130910	1
Klenk	Caraway	2770a120905	2
Klenk	Caraway	2770A140708	1
Klenk	Caraway	2770A131008	4
Klenk	Caraway	2770A120905	8
Klenk	Caraway	2770A120403	15
Klenk	Caraway	2770A110818	8
Klenk	Caraway	1810A-01537	1
Klenk	Caraway	2270A130521	1
Klenk	Caraway	2770A110601	15
Klenk	Ceylon cinnamon, fine...	614B120411	2
Klenk	Ceylon cinnamon, fine...	614b121024	1
Klenk	Ceylon cinnamon, fine...	614B121024	4
Klenk	Ceylon cinnamon, fine...	614B121010	2
Klenk	Ceylon cinnamon, fine...	614a120411	1
Klenk	Ceylon cinnamon, fine...	614B151008	1
Klenk	Ceylon cinnamon, fine...	614B150422	1
Klenk	Chickweed herb, cut	4551B090528	1
Klenk	Chickweed herb, cut	4551b110222	1
Klenk	Chicory herb, cut	4510I-01634	1
Klenk	Chicory herb, cut	3751A120123	4
Klenk	Chicory herb, cut	A120123	2
Klenk	Chicory herb, cut	3751c120614	1
Klenk	Chicory herb, cut	3751a120307	1
Klenk	Chicory herb, cut	3751A120307	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Chicory herb, cut	3751A-100118	1
Klenk	Chicory herb, cut	3751A080902	1
Klenk	Chicory herb, cut	3751A100118	1
Klenk	Cinchona bark, cut	601B130415	1
Klenk	Cinnamon bark, cut	610A130927	1
Klenk	Cinnamon bark, cut	610A101018	1
Klenk	Cinnamon bark, sticks	610A101018	1
Klenk	Cinnamon bark, sticks	A101018	1
Klenk	Cloves	1260A100617	2
Klenk	Cloves	PZN03485222	1
Klenk	Cloves	1260A130903	2
Klenk	Cloves	1260A120328	5
Klenk	Cloves	pzn3485222	1
Klenk	Cloves	pzn03485222	1
Klenk	Cloves	1260A101223	2
Klenk	Cloves	A120328	1
Klenk	Cloves	1260A150304	2
Klenk	Cloves	1260A110608	6
Klenk	Clubmoss herb, cut	4111B110428	2
Klenk	Colewort, cut	3931B080714	2
Klenk	Coltsfoot leaves, cut	2021C130326	10
Klenk	Coltsfoot leaves, cut	2021b121204	1
Klenk	Coltsfoot leaves, cut	2021B130319	6
Klenk	Coltsfoot leaves, cut	23121302	1
Klenk	Coltsfoot leaves, cut	2021B140131	2
Klenk	Coltsfoot leaves, cut	B120124	1
Klenk	Coltsfoot leaves, cut	2021B111111	5
Klenk	Coltsfoot leaves, cut	2020B120124	1
Klenk	Coltsfoot leaves, cut	2012B120124	1
Klenk	Coltsfoot leaves, cut	20021301	1
Klenk	Coltsfoot leaves, cut	14111302	1
Klenk	Coltsfoot leaves, cut	11101202	1
Klenk	Coltsfoot leaves, cut	8061207	1
Klenk	Coltsfoot leaves, cut	5011301	1
Klenk	Coltsfoot leaves, cut	2021B121203	6
Klenk	Coltsfoot leaves, cut	2021B111005	2
Klenk	Coltsfoot leaves, cut	KS100061	1
Klenk	Coltsfoot leaves, cut	26091301	1
Klenk	Coltsfoot leaves, cut	B130227	1
Klenk	Coltsfoot leaves, cut	2021B120601	4
Klenk	Comfrey herb, cut	4561B100518	2
Klenk	Comfrey root	6241B121214	2
Klenk	Comfrey root	6241b130619	1
Klenk	Comfrey root	6244B130624	1
Klenk	Comfrey root	6241B130724	5
Klenk	Comfrey root	6241B131009	1
Klenk	Comfrey root	6241b130724	1
Klenk	Comfrey root	6241B120807	4
Klenk	Comfrey root	6241B130312	2
Klenk	Comfrey root	6241B130619	3
Klenk	Comfrey root	6241B100715	1
Klenk	Comfrey root	6241B110811	1
Klenk	Comfrey root	6241B06110202	1
Klenk	Common centaury, cut	B120628	1
Klenk	Common centaury, cut	3711B-111216	1
Klenk	Common centaury, cut	3711B111216	2
Klenk	Common knotgrass herb...	4301A121120	3
Klenk	Common knotgrass herb...	4301A120912	2
Klenk	Coriander	2790a121023	1
Klenk	Coriander	A121023	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Coriander	2709A130129	1
Klenk	Coriander	2790A121023	9
Klenk	Coriander	2790A130129	1
Klenk	Corn silk, cut	A110411	1
Klenk	Corn silk, cut	5581A111206	1
Klenk	Corn silk, cut	5581A081204	1
Klenk	Cornflower flower wit...		1
Klenk	Couchgrass root rhizo...	6781N111019	1
Klenk	Cowberry leaves, cut	2431B101006	2
Klenk	Cudweed flower, cut	1591A110511	14
Klenk	Cudweed flower, cut	1591A-110511	1
Klenk	Curcuma rhizome, cut	6741B121030	1
Klenk	Curcuma rhizome, cut	6741a110202	1
Klenk	Daisies	A130705	1
Klenk	Daisies	1210A120215	5
Klenk	Daisies	1210A110223	1
Klenk	Daisies	1210a071301	1
Klenk	Dandelion herb with r...	6611B-120620	1
Klenk	Dandelion herb with r...	6611A110104	1
Klenk	Dandelion herb with r...	6611B110104	6
Klenk	Dandelion herb with r...	6611b110929	2
Klenk	Dandelion herb with r...	6611B-131206	1
Klenk	Dandelion herb with r...	6611B420620	1
Klenk	Dandelion herb with r...	6611B160613	1
Klenk	Dandelion herb with r...	6611B130314	4
Klenk	Dandelion herb with r...	6611B090306	1
Klenk	Dandelion herb with r...	6611B1104104	1
Klenk	Dandelion herb with r...	6611B110929	3
Klenk	Dandelion root, cut	6621A141027	2
Klenk	Dandelion root, cut	6621A140114	4
Klenk	Dandelion root, cut	N130813	1
Klenk	Dandelion root, cut	6621B151029	1
Klenk	Dandelion root, cut	A120606	1
Klenk	Dandelion root, cut	6621A140114	3
Klenk	Dandelion root, cut	6621A120606	22
Klenk	Dandelion root, cut	6101202	1
Klenk	Dandelion root, cut	6621A120208	10
Klenk	Dandelion root, cut	4513A-07035	1
Klenk	Dandelion root, cut	6621N130813	8
Klenk	Dandelion root, cut	6621A110420	5
Klenk	Danewort root, cut	6281B110427	4
Klenk	Deadnettle flower	1470a120111	1
Klenk	Deadnettle flower	1470A080103	1
Klenk	Deadnettle flower	1470A080910	1
Klenk	Deadnettle flower	nachprüfung	1
Klenk	Deadnettle flower	1470a080103	1
Klenk	Deadnettle flower	1470A120111	5
Klenk	Devil's claw root	6331B120508	4
Klenk	Devil's claw root	6331B130129	4
Klenk	Dill seeds	A120312	1
Klenk	Dill seeds	2680a120312	1
Klenk	Dill seeds	2680A-120312	1
Klenk	Dill seeds	2680A120312	7
Klenk	Dill seeds	2680A130806	1
Klenk	Dill tips, cut	3531B110726	1
Klenk	Elder flower, rubbed	1571A130627	1
Klenk	Elder flower, rubbed	1571A141126	1
Klenk	Elder flower, rubbed	1571A121121	23
Klenk	Elder flower, rubbed	1571A110223	19
Klenk	Elder flower, rubbed	157A120215	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Elder flower, rubbed	16061201	1
Klenk	Elder flower, rubbed	1571A130930	3
Klenk	Elder flower, rubbed	21091201	1
Klenk	Elder flower, rubbed	1571a121121	2
Klenk	Elder flower, rubbed	13021301	1
Klenk	Elder flower, rubbed	1021304	1
Klenk	Elder flower, rubbed	1571A121022	18
Klenk	Elder flower, rubbed	1901211471	1
Klenk	Elder flower, rubbed	1571A-110223	1
Klenk	Elder flower, rubbed	1571a120215	1
Klenk	Elder flower, rubbed	1571a121022	3
Klenk	Elder flower, rubbed	1571a1211	1
Klenk	Elder flower, rubbed	A120215	1
Klenk	Elder flower, rubbed	1571A110125	3
Klenk	Elder flower, rubbed	A121121	1
Klenk	Elder flower, rubbed	1571A120215	8
Klenk	Elder flower, rubbed	26061201	1
Klenk	Elfwort root, cut	6341B130423	2
Klenk	Elfwort root, cut	6341B120611	2
Klenk	Elfwort root, cut	6341B100426	2
Klenk	Elfwort root, cut	B130423	2
Klenk	Elfwort root, cut	6311141B130423	1
Klenk	Elm bark, cut	841a120413	1
Klenk	Elm bark, cut	841A1101120	1
Klenk	Eucalyptus leaves, cut	2011B110801	4
Klenk	Eucalyptus leaves, cut	2011B120419	5
Klenk	Eucalyptus leaves, cut	2011b130306	1
Klenk	Eucalyptus leaves, cut	B120419	1
Klenk	Eucalyptus leaves, cut	2011B130306-35294110	1
Klenk	Eucalyptus leaves, cut	B130306	2
Klenk	Eucalyptus leaves, cut	2011B130306	4
Klenk	Eyebright herb, cut	B130430	1
Klenk	Eyebright herb, cut	3871B100713	1
Klenk	Eyebright herb, cut	B101206	1
Klenk	Eyebright herb, cut	15029806	1
Klenk	Eyebright herb, cut	3871B130430	1
Klenk	Fenugreek seeds	7260A120118	20
Klenk	Fenugreek seeds	A130603	1
Klenk	Fenugreek seeds	9011301	1
Klenk	Fenugreek seeds	7260A110530	18
Klenk	Fenugreek seeds	7260A130603	10
Klenk	Fenugreek seeds	8061301	1
Klenk	Fenugreek seeds, powd...	7264A110201	8
Klenk	Fenugreek seeds, powd...	A110201	1
Klenk	Feverfew, cut	4831B110819	2
Klenk	Flax weed herb, cut	4011B131115	3
Klenk	Flax weed herb, cut	4011B121207	2
Klenk	Flaxseeds	7397A140605	1
Klenk	Flaxseeds	737A130722	1
Klenk	Flaxseeds	7307A140605	1
Klenk	Flaxseeds	7307A141201	6
Klenk	Flaxseeds	7308A100705	1
Klenk	Flaxseeds	7308A111107	5
Klenk	Flaxseeds	7307a111107	1
Klenk	Flaxseeds	7308A130110	5
Klenk	Flaxseeds	7307A130110	17
Klenk	Flaxseeds	7307A131021	1
Klenk	Flaxseeds	1913Q-02240	1
Klenk	Flaxseeds	7307A121212	2
Klenk	Flaxseeds	5615003	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Flaxseeds	7307A-130722	1
Klenk	Flaxseeds	7300A130110	9
Klenk	Flaxseeds	7300A111107	6
Klenk	Flaxseeds	7300A100705	2
Klenk	Flaxseeds	A130110	1
Klenk	Flaxseeds	7307A130722	7
Klenk	Flaxseeds	2002285	1
Klenk	Flaxseeds	1910212240	1
Klenk	Flaxseeds	7307a131104	1
Klenk	Flaxseeds	7500A140556	1
Klenk	Flaxseeds	7307A150710	3
Klenk	Flaxseeds	7307A131104	13
Klenk	Flaxseeds	7307A140526	2
Klenk	Flaxseeds	903312240	1
Klenk	Flaxseeds	7307A130124	2
Klenk	Flaxseeds	7300A130722	9
Klenk	Flaxseeds	7307A-130110	1
Klenk	Flaxseeds	3707A140526	1
Klenk	Flaxseeds	7300a130110	1
Klenk	Flaxseeds	7300A141201	3
Klenk	Flohsamen	7560A140203	1
Klenk	Flohsamen	7380A120109	26
Klenk	Flohsamen	7380A150520	2
Klenk	Flohsamen	7380A111018	2
Klenk	Flohsamen	7560A120330	1
Klenk	Flohsamen	7560A130418	1
Klenk	Flohsamen	7560a120330	1
Klenk	Flohsamen	A120109	1
Klenk	Flohsamen	A120911	1
Klenk	Flohsamen	7380a120109	5
Klenk	Flohsamen	A130128	1
Klenk	Flohsamen	7380a111018	1
Klenk	Flohsamen	7380A110317	1
Klenk	Flohsamen	7380A120911	16
Klenk	Flohsamen	7380A130128	6
Klenk	Frangula bark, cut	661B-090903	1
Klenk	Frangula bark, cut	nachprüfung	1
Klenk	Frangula bark, cut	661B130306	1
Klenk	Frangula bark, cut	6621B110412	1
Klenk	Frangula bark, cut	661B-110412	1
Klenk	Frangula bark, cut	pzn4266611	1
Klenk	Fumitory herb, cut	B120410	1
Klenk	Gentian root, cut	6311B110509	1
Klenk	Gentian root, cut	6311B100817	2
Klenk	Gentian root, cut	6311B130205	2
Klenk	Gentian root, cut	6311a120723	1
Klenk	Gentian root, cut	6311A120723	4
Klenk	Gentian root, cut	1911E-02142	1
Klenk	Genuine cleaver's her...	3921C130226	1
Klenk	Genuine cleaver's her...	3921B101012	1
Klenk	Genuine golden rot wo...	1781B110706	2
Klenk	Ginger rhizome, peeled	6951B100302	1
Klenk	Ginger rhizome, peeled	6951B110822	2
Klenk	Ginger rhizome, peeled	6951B110119	1
Klenk	Ginger rhizome, peeled...	B121030	2
Klenk	Ginger rhizome, peeled...	6954B121030	2
Klenk	Ginger rhizome, peeled...	6954B130418	2
Klenk	Ginger rhizome, peeled...	6954B110801	1
Klenk	Ginkgo leaves, cut	2461A100429	10
Klenk	Ginkgo leaves, cut	2461B111108	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Goat's rue herb, cut	3901C110905	1
Klenk	Goat's rue herb, cut	3901B140801	1
Klenk	Golden rot wort, cut	4521A110209	5
Klenk	Golden rot wort, cut	4521A100414	1
Klenk	Golden rot wort, cut	A110209	1
Klenk	Golden rot wort, cut	4521A-110816	1
Klenk	Golden rot wort, cut	1781B110706	1
Klenk	Ground ivy herb, cut	3991B110304	3
Klenk	Ground ivy herb, cut	3991B130502	2
Klenk	Ground ivy herb, cut	11052317	1
Klenk	Hart's-tongue, cut	4451B120605	1
Klenk	Hart's-tongue, cut	4451B091116	1
Klenk	Hawthorn flower	1351B130819	3
Klenk	Hawthorn fruit	2806B121203	2
Klenk	Hawthorn fruit	2806B110818	2
Klenk	Hawthorn leaves with ...	1971a120215	1
Klenk	Hawthorn leaves with ...	1971a120727	1
Klenk	Hawthorn leaves with ...	1971a120813	2
Klenk	Hawthorn leaves with ...	1972A120727	1
Klenk	Hawthorn leaves with ...	20121302	1
Klenk	Hawthorn leaves with ...	28101307	1
Klenk	Hawthorn leaves with ...	1971A110620	7
Klenk	Hawthorn leaves with ...	A130307	1
Klenk	Hawthorn leaves with ...	1971A120813-34103101	1
Klenk	Hawthorn leaves with ...	1971A130307-3447	1
Klenk	Hawthorn leaves with ...	1971A130307-35014110	1
Klenk	Hawthorn leaves with ...	1971A120727	12
Klenk	Hawthorn leaves with ...	1971A120813	22
Klenk	Hawthorn leaves with ...	14101301	1
Klenk	Hay flowers	A130304	1
Klenk	Hay flowers	10192103	1
Klenk	Hay flowers	1400A120116	1
Klenk	Heather flower, rubbed	13014202	1
Klenk	Hemp nettle herb, cut	3911a130320	2
Klenk	Hemp nettle herb, cut	3911A090219	2
Klenk	Hemp nettle herb, cut	3911A080409	1
Klenk	Hemp nettle herb, cut	3911A130110	3
Klenk	Henna leaves powder	2074A111004	1
Klenk	Henna leaves powder	20747A111004	1
Klenk	Herb Robert, cut	3951B12118	1
Klenk	Herb Robert, cut	3951-A-110621	1
Klenk	Herb Robert, cut	3951B121218	2
Klenk	Hibiscus flower	B130205	1
Klenk	Hibiscus flower	1431B-110519	1
Klenk	Hibiscus flower	1431B111122	1
Klenk	Hibiscus flower	1431B130205	1
Klenk	Hop strobile	1451B140408	2
Klenk	Hop strobile	1451B130107	6
Klenk	Hop strobile	1451b130107	1
Klenk	Hop strobile	1451b130409	1
Klenk	Hop strobile	4301135	1
Klenk	Hop strobile	B130409	1
Klenk	Hop strobile	1450A110712	1
Klenk	Hop strobile	1451B130409	1
Klenk	Hop strobile	20071301	1
Klenk	Hop strobile	12008304	1
Klenk	Hop strobile	1451B120817	12
Klenk	Hop strobile	1451B111004	2
Klenk	Hop strobile	1451B-120817	1
Klenk	Horehound herb, cut	4141A130110	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Horehound herb, cut	13289102	1
Klenk	Horse chestnut flower...	1440A110311	3
Klenk	Horse chestnut leaves...	2551B111013	9
Klenk	Horse chestnut leaves...	255100903	1
Klenk	Horse chestnut leaves...	N130124	2
Klenk	Horse chestnut leaves...	2551B081223	1
Klenk	Horse chestnut leaves...	2551N130124	3
Klenk	Horsetail herbs, cut	3831A11124	1
Klenk	Horsetail herbs, cut	3831N110218	1
Klenk	Horsetail herbs, cut	3831A110601	1
Klenk	Horsetail herbs, cut	3831A111124	7
Klenk	Horsetail herbs, cut	1804211642	1
Klenk	Horsetail herbs, cut	3831A120726	11
Klenk	Horsetail herbs, cut	3831A120018	1
Klenk	Horsetail herbs, cut	3831A120903	4
Klenk	Horsetail herbs, cut	3831A120529	8
Klenk	Horsetail herbs, cut	3831A121018	4
Klenk	Horsetail herbs, cut	3831A110922	2
Klenk	Horsetail herbs, cut	3831A120611	3
Klenk	Iceland moss, cut	5191A140828	1
Klenk	Indian psyllium	20071302	1
Klenk	Indian psyllium	7560A140203	4
Klenk	Indian psyllium	7560A120828	6
Klenk	Indian psyllium	7560A150420	3
Klenk	Indian psyllium	7560A120330	1
Klenk	Ivy leaves, cut	B130118	1
Klenk	Jasmin flower	1460A110505	1
Klenk	Javanese curcuma root...	B130117	1
Klenk	Juniper berries	2890A130513	1
Klenk	Juniper berries	A120709	2
Klenk	Juniper berries	2890A120709	6
Klenk	Juniper berries, crus...	2896B121016	7
Klenk	Kaolin, heavy	424A100819	2
Klenk	Kaolin, heavy	424A130507	1
Klenk	Kaolin, heavy	45131I01190	1
Klenk	Kaolin, heavy	424A130507	4
Klenk	Lady's mantle herb, cut	3501C121105	2
Klenk	Lady's mantle herb, cut	3501B090417	1
Klenk	Lady's mantle herb, cut	3501B100428	2
Klenk	Lady's mantle herb, cut	3501A110301	4
Klenk	Lapacho bark, cut	13298302	1
Klenk	Lavender flower	1489A120919	7
Klenk	Lavender flower	1489A1203	1
Klenk	Lavender flower	1802211462	1
Klenk	Lavender flower	1489A1209019	1
Klenk	Lavender flower	313U-01462	1
Klenk	Lavender flower	1137903	1
Klenk	Lavender flower	1489A100125	1
Klenk	Lavender flower	1488A111201	2
Klenk	Lavender flower	1488A120803	3
Klenk	Lavender flower	1488B130111	2
Klenk	Lavender flower	1488B130604	5
Klenk	Lemon grass, cut	7721A120906	1
Klenk	Lemon grass, cut	7721A130708	1
Klenk	Lemon grass, cut	A130907	1
Klenk	Lemon grass, cut	A120906	1
Klenk	Lemon peel, cut	A130221	2
Klenk	Lemon peel, cut	621A091016	1
Klenk	Lemon verbena, cut	2411B110408	2
Klenk	Lime flower, cut	1611B130905	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Lime flower, cut	1611B131220	1
Klenk	Lime flower, cut	1611A121120	10
Klenk	Lime flower, cut	1611B130307	3
Klenk	Lime flower, cut	B130307	2
Klenk	Lime flower, cut	Pr.Nr. 4411A-01474	1
Klenk	Lime flower, cut	1611A12110	1
Klenk	Lime flower, cut	1611B111011	5
Klenk	Lime flower, cut	1611a121120	2
Klenk	Lime flower, cut	1611B121105	6
Klenk	Lime flower, cut	1611B1010004	1
Klenk	Lime flower, cut	B130905	4
Klenk	Lime flower, cut	1611b121105	1
Klenk	Lime flower, cut	1611B110421	2
Klenk	Lime flower, cut	1611B11011	1
Klenk	Liquorice root, peeled	6381A140109	1
Klenk	Liquorice root, peeled	6381A121126	31
Klenk	Liquorice root, peeled	6281a120611	1
Klenk	Liquorice root, peeled	6381a121126	1
Klenk	Liquorice root, peeled	6381A120611	13
Klenk	Liquorice root, peeled	6381A110531	1
Klenk	Liquorice root, peeled	6381A130426	20
Klenk	Liquorice root, peeled	A130820	3
Klenk	Liquorice root, peeled	6381A130820	6
Klenk	Liquorice root, peeled	6381a111004	1
Klenk	Liquorice root, peeled	6381A111004	17
Klenk	Liquorice root, peeled	6381a120611	1
Klenk	Liquorice root, peeled	6381A120806	5
Klenk	Liquorice root, peeled	6381111A121126	1
Klenk	Liquorice root, unpee...	6391A110421	4
Klenk	Liquorice root, unpee...	6391A080905	5
Klenk	Liquorice root, unpee...	6390A101020	1
Klenk	Lovage root, cut	B110228	1
Klenk	Lovage root, cut	6371B121029	2
Klenk	Lovage root, cut	6371B-121029	1
Klenk	Lovage root, cut	6371b121029	1
Klenk	Lovage root, cut	6371A080508	4
Klenk	Lovage root, cut	B121029	1
Klenk	Lungwort herb, cut	4331A120813	1
Klenk	Lungwort herb, cut	4331B111205	2
Klenk	Mallow flower, cut	1501b111215	1
Klenk	Mallow flower, cut	1910211464	1
Klenk	Mallow flower, cut	1501B130829	3
Klenk	Mallow flower, cut	1501B-120427	1
Klenk	Mallow flower, cut	1501B120508	6
Klenk	Mallow flower, cut	1501B120427	11
Klenk	Mallow flower, cut	1501b110207	1
Klenk	Mallow flower, cut	B130829	3
Klenk	Mallow flower, cut	1501B100408	1
Klenk	Mallow flower, cut	B120427	1
Klenk	Mallow flower, cut	1501B110207	2
Klenk	Mallow flower, cut	150B111215	1
Klenk	Mallow leaves, cut	2131B10529	1
Klenk	Mallow leaves, cut	B130225	1
Klenk	Mallow leaves, cut	2131B130225	4
Klenk	Mallow leaves, cut	2131B120529	7
Klenk	Mallow leaves, cut	2131B110420	4
Klenk	Manna, cut	5221A150107	1
Klenk	Manna, cut	5221A140210	4
Klenk	Manna, cut	5221A110314	1
Klenk	Manna, cut	5221A120509	9

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Marian thistle fruit	70180A120725	1
Klenk	Marian thistle fruit	7180A120725	3
Klenk	Marian thistle fruit	7180A120207	2
Klenk	Marian thistle fruit	A120725	1
Klenk	Marian thistle fruit	6621A120606	1
Klenk	Marian thistle fruit	7180A090929	1
Klenk	Marian thistle fruit	7180A132019	1
Klenk	Marian thistle fruit	7180A130219	2
Klenk	Marian thistle herb, ...	3701A111207	12
Klenk	Marian thistle herb, ...	2011402	1
Klenk	Marian thistle herb, ...	11041310	1
Klenk	Marian thistle herb, ...	913E-01627	1
Klenk	Marian thistle herb, ...	3701B111117	1
Klenk	Marian thistle herb, ...	3701A100916	2
Klenk	Marian thistle herb, ...	B110728	1
Klenk	Marian thistle herb, ...	3701a111207	1
Klenk	Marian thistle herb, ...	3701B110610	1
Klenk	Marian thistle herb, ...	3701B130318	6
Klenk	Marigold flower witho...	C120321	1
Klenk	Marigold flower witho...	1241B120312	1
Klenk	Marigold flower witho...	1241B130517	1
Klenk	Marigold flower witho...	1250A110511	1
Klenk	Marigold flower, cut	204311448	1
Klenk	Marigold flower, cut	1241B110118	2
Klenk	Marigold flower, cut	1241B150902	1
Klenk	Marigold flower, cut	1240A110418	2
Klenk	Marigold flower, cut	1241B130321	6
Klenk	Marigold flower, cut	1241B120419	3
Klenk	Marigold flower, cut	1241B130927	1
Klenk	Marigold flower, cut	1241B160530	1
Klenk	Marigold flower, cut	B130517	2
Klenk	Marigold flower, cut	3013E1448	1
Klenk	Marigold flower, cut	2000234	1
Klenk	Marigold flower, cut	112211448	1
Klenk	Marigold flower, cut	1241B140211	1
Klenk	Marigold flower, cut	1241N151209	1
Klenk	Marjoram herb, rubbed	ohne	1
Klenk	Marjoram herb, rubbed	A101025	2
Klenk	Marjoram herb, rubbed	4881a101025	1
Klenk	Marjoram herb, rubbed	4881A101025	16
Klenk	Marjoram herb, rubbed	12345678	1
Klenk	Marjoram herb, rubbed	4881A091119	1
Klenk	Marshmallow root, pee...	A130408	1
Klenk	Marshmallow root, pee...	6074B100416	1
Klenk	Marshmallow root, pee...	6071a130408	1
Klenk	Marshmallow root, pee...	6071A-120314	1
Klenk	Marshmallow root, pee...	6071A120314	4
Klenk	Marshmallow root, pee...	6071A130408	4
Klenk	Marshmallow root, pee...	6071A130116	6
Klenk	Marshmallow root, pee...	130116	1
Klenk	Mate leaves, cut	2141A-101102	1
Klenk	Mate leaves, cut	2141A120821	2
Klenk	Mate leaves, cut	2131A111213	1
Klenk	Matricaria flower	1290A130502	1
Klenk	Matricaria flower	A130516	1
Klenk	Matricaria flower	B130415	2
Klenk	Matricaria flower	1290A-120620	1
Klenk	Matricaria flower	1290A120529	3
Klenk	Matricaria flower	1290A12061	1
Klenk	Matricaria flower	1290A110825	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Matricaria flower	11101302	1
Klenk	Matricaria flower	4100113002	2
Klenk	Matricaria flower	A130502	1
Klenk	Matricaria flower	1290A20404	1
Klenk	Matricaria flower	A120529	1
Klenk	Matricaria flower	1290B140123	1
Klenk	Matricaria flower	1290B130415	39
Klenk	Matricaria flower	14111314	1
Klenk	Matricaria flower	16121301	1
Klenk	Matricaria flower	1290A130516	7
Klenk	Matricaria flower	2310211452	1
Klenk	Matricaria flower	27111204	1
Klenk	Matricaria flower	27111209	1
Klenk	Matricaria flower	1290A150618	1
Klenk	Matricaria flower	1290A120620	18
Klenk	Matricaria flower	A120529	1
Klenk	Matricaria flower	1290A120601	14
Klenk	Matricaria flower	1290B101122	1
Klenk	Matricaria flower	1290a120620	1
Klenk	Matricaria flower	1290A110421	1
Klenk	Matricaria flower	1290A110607	3
Klenk	Matricaria flower	1290A120529	1
Klenk	Matricaria flower	1290A120404	1
Klenk	Matricaria flower	1290A130516	1
Klenk	Matricaria flower	1290A120404	11
Klenk	Matricaria flower	1290A120601	2
Klenk	Matricaria flower	129A120620	1
Klenk	Matricaria flower	2701211452	1
Klenk	Matricaria flower	1290B130415	4
Klenk	Meadowsweet flower, r...	A120312	1
Klenk	Meadowsweet herb, cut	4541A120313	2
Klenk	Melilot herb, cut	4151A120912	2
Klenk	Melissa leaves, cut	27091201	1
Klenk	Melissa leaves, cut	111207	1
Klenk	Melissa leaves, cut	2161A121009	15
Klenk	Melissa leaves, cut	2161A120718	17
Klenk	Melissa leaves, cut	2161A151209	1
Klenk	Melissa leaves, cut	2161A130806	4
Klenk	Melissa leaves, cut	2161A121009/PN:1198	1
Klenk	Melissa leaves, cut	2161A101216	1
Klenk	Melissa leaves, cut	2807211503	1
Klenk	Melissa leaves, cut	2161a111207	2
Klenk	Melissa leaves, cut	2161A121206	3
Klenk	Melissa leaves, cut	2161A110207	1
Klenk	Melissa leaves, cut	2161A111207	20
Klenk	Melissa leaves, cut	2161A110818	1
Klenk	Melissa leaves, cut	2161A121029	6
Klenk	Mistletoe herb, cut	4961A120419	2
Klenk	Mistletoe herb, cut	4691a110816	1
Klenk	Mistletoe herb, cut	110816	1
Klenk	Mistletoe herb, cut	4691A121122	11
Klenk	Mistletoe herb, cut	1512211695	1
Klenk	Mistletoe herb, cut	4691A110816	2
Klenk	Mistletoe herb, cut	2901311695	1
Klenk	Mistletoe herb, cut	4691A121122-35454110	1
Klenk	Mistletoe herb, cut	4691A130307	7
Klenk	Mistletoe herb, cut	603211695	1
Klenk	Mistletoe herb, cut	4691A720507	1
Klenk	Mistletoe herb, cut	4691a130307	2
Klenk	Mistletoe herb, cut	4691a121122	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Mistletoe herb, cut	4691A120507	3
Klenk	Mistletoe herb, cut	4691A-120507	1
Klenk	Mistletoe herb, cut	4691A120419	9
Klenk	Monk's pepper fruit	7110N090701	1
Klenk	Monk's pepper fruit	A130613	1
Klenk	Monk's pepper fruit	A110614	3
Klenk	Monk's pepper fruit	12274007	3
Klenk	Monk's pepper fruit	A120803	1
Klenk	Monk's pepper fruit	7110A110614	2
Klenk	Monk's pepper fruit	7110N150121	1
Klenk	Monk's pepper fruit	7110A130613	1
Klenk	Motherwort herb, cut	4071A-100707	1
Klenk	Mouse-ear hawkweed, cut	B111005	1
Klenk	Mouse-ear hawkweed, cut	3611B11105	1
Klenk	Mugwort herb, cut	A120123	2
Klenk	Mugwort herb, cut	7312754	1
Klenk	Mugwort herb, cut	3591a130218	2
Klenk	Mugwort herb, cut	3591A130218	9
Klenk	Mugwort herb, cut	3591A120123	7
Klenk	Mugwort herb, cut	2591A130218	1
Klenk	Mugwort herb, cut	12016707	4
Klenk	Mugwort herb, cut	3591a120123	1
Klenk	Mugwort herb, cut	12016708	5
Klenk	Mugwort herb, cut	3591A11119	1
Klenk	Mullein flower, cut	1651b130820	2
Klenk	Mullein flower, cut	1651B140324	2
Klenk	Mullein flower, cut	1650A100608	1
Klenk	Mullein flower, cut	1651B110203	2
Klenk	Mullein flower, cut	1651b120315	1
Klenk	Mullein flower, cut	1650A120612	1
Klenk	Mullein flower, cut	1651B110915	1
Klenk	Mullein flower, cut	1651B121109	20
Klenk	Mullein flower, cut	1650A111018	2
Klenk	Mullein flower, cut	A120612	1
Klenk	Mullein flower, cut	1651B130820	3
Klenk	Mullein flower, cut	1651B150722	1
Klenk	Mullein flower, cut	3951B121218	1
Klenk	Mullein flower, cut	1651B120315	5
Klenk	Myrrh	3351A100628	1
Klenk	Myrrh	3351A120514	1
Klenk	Myrrh	3351A121004	1
Klenk	Myrrh	3351A130902	1
Klenk	Nettle leaves, cut	2381A-120619	1
Klenk	Nettle leaves, cut	2381A121010	2
Klenk	Nettle leaves, cut	2381A130703	13
Klenk	Nettle leaves, cut	2381A130122	26
Klenk	Nettle leaves, cut	2381A120619	15
Klenk	Nettle leaves, cut	2381a100818	1
Klenk	Nettle leaves, cut	2372A130703	1
Klenk	Nettle leaves, cut	1913A-03054	1
Klenk	Nettle leaves, cut	1107211689	1
Klenk	Nettle leaves, cut	2381a120619	4
Klenk	Nettle leaves, cut	A110913	1
Klenk	Nettle leaves, cut	A130703	1
Klenk	Nettle leaves, cut	A130122	1
Klenk	Nettle leaves, cut	4513E3054	1
Klenk	Nettle leaves, cut	2381A151012	1
Klenk	Nettle leaves, cut	2381A150109	1
Klenk	Nettle leaves, cut	2381A140221	1
Klenk	Nettle leaves, cut	2381a130122	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Nettle leaves, cut	2381A-121010	1
Klenk	Nettle leaves, cut	114Q-03054	1
Klenk	Nettle leaves, cut	2381A110913	23
Klenk	Nettle leaves, cut	2381A110809	1
Klenk	Nettle root, cut	6631N110513	1
Klenk	Nettle root, cut	9931B120927	1
Klenk	Nettle root, cut	nachprüfung	1
Klenk	Nettle root, cut	6631B120416	1
Klenk	Nettle seeds	7470A141021	1
Klenk	Nettle seeds	7470A110418	1
Klenk	Nettle seeds	2021505	1
Klenk	Nutmeg, powdered (spi...	7325A130515	1
Klenk	Nutmeg, powdered (spi...	7325A120903	2
Klenk	Nutmeg, powdered (spi...	7325a120903	1
Klenk	Nutmeg, powdered (spi...	A130304	2
Klenk	Nutmeg, powdered (spi...	7325A130304	1
Klenk	Oak bark, cut	761A090420	2
Klenk	Oak bark, cut	761A110816	1
Klenk	Oak bark, cut	761A110816	9
Klenk	Oak bark, cut	C-280513-2	1
Klenk	Olive tree leaves	2211B120417	2
Klenk	Olive tree leaves	2211B130425	3
Klenk	Olive tree leaves	2211B131025	1
Klenk	Olive tree leaves	2211B150818	1
Klenk	Orange peel, cut	531A130204	5
Klenk	Orange peel, cut	531a130204	1
Klenk	Ortisophon leaves, cut	2221B121112	15
Klenk	Ortisophon leaves, cut	2221B12112	1
Klenk	Ortisophon leaves, cut	2221B110718	10
Klenk	Ortisophon leaves, cut	221B121112	1
Klenk	Ortisophon leaves, cut	17121304	1
Klenk	Ortisophon leaves, cut	B121112	3
Klenk	Ortisophon leaves, cut	B110718	1
Klenk	Pansy herb, cut	4681A110303	2
Klenk	Pansy herb, cut	4681B130715	6
Klenk	Pansy herb, cut	4681A-120806	1
Klenk	Pansy herb, cut	B130715	1
Klenk	Pansy herb, cut	4681A120806	10
Klenk	Pansy herb, cut	11216103	5
Klenk	Parsley seeds	7370A09120	1
Klenk	Parsley seeds	nachprüfung	1
Klenk	Passionflower herb, cut	4231A-110913	1
Klenk	Passionflower herb, cut	A120329	2
Klenk	Passionflower herb, cut	4231A120329	2
Klenk	Peppermint leaves, cut	2161A110207	1
Klenk	Peppermint leaves, cut	A130806	1
Klenk	Peppermint leaves, cut	A121009	1
Klenk	Peppermint leaves, cut	4513E1503	1
Klenk	Peppermint leaves, cut	1913A-01505	1
Klenk	Peppermint leaves, cut	2161a121029	1
Klenk	Peppermint leaves, cut	2161A-121206	1
Klenk	Peppermint leaves, cut	2161B140321	1
Klenk	Peppermint leaves, cut	2181A13020	1
Klenk	Peppermint leaves, cut	2181A-120913	1
Klenk	Peppermint leaves, cut	4113Q1505	1
Klenk	Peppermint leaves, cut	2183A120913	2
Klenk	Peppermint leaves, cut	2181A110512	9
Klenk	Peppermint leaves, cut	2181A120913	38
Klenk	Peppermint leaves, cut	2181A-101013	1
Klenk	Peppermint leaves, cut	2181A100323	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Peppermint leaves, cut	2181A101013	9
Klenk	Peppermint leaves, cut	CH.2161B080818	1
Klenk	Peppermint leaves, cut	2161	1
Klenk	Peppermint leaves, cut	2161A07020203	1
Klenk	Peppermint leaves, cut	2161A121206	15
Klenk	Peppermint leaves, cut	2181A130320	6
Klenk	Peppermint leaves, cut	2181B130717	9
Klenk	Peppermint leaves, cut	312172/3	1
Klenk	Peppermint leaves, cut	1001311505	1
Klenk	Peppermint leaves, cut	2161A121009	6
Klenk	Peppermint leaves, cut	2161A130806	8
Klenk	Peppermint leaves, cut	2181a120913	3
Klenk	Peppermint leaves, cut	1209211505	1
Klenk	Plantain herb, cut	N111121	1
Klenk	Plantain herb, cut	4281N110404	1
Klenk	Plantain herb, cut	4281N111121	5
Klenk	Plantain leaves, cut	4271A-110816	1
Klenk	Plantain leaves, cut	4271A111125	2
Klenk	Plantain leaves, cut	4271A100615	4
Klenk	Plantain leaves, cut	4271A130115	7
Klenk	Plantain leaves, cut	4271A110816	4
Klenk	Plantain leaves, cut	427A111125	1
Klenk	Plantain leaves, cut	4281N111121	2
Klenk	Plantain leaves, cut	A110816	1
Klenk	Poplar buds	3260A120828	1
Klenk	Primrose flower	1540A100907	1
Klenk	Primrose flower	1541B130808	6
Klenk	Primrose flower	1541B110314	11
Klenk	Primrose flower	1541B100414	2
Klenk	Primrose flower	B130808	1
Klenk	Primrose flower	B130808	1
Klenk	Primrose flower	B110314	1
Klenk	Primrose flower	A111018	1
Klenk	Primrose flower	1540A-100907	1
Klenk	Primrose root, cut	B130218	3
Klenk	Primrose root, cut	6461A100511	1
Klenk	Raspberry leaves, cut	2291A110125	1
Klenk	Raspberry leaves, cut	A130430	1
Klenk	Raspberry leaves, cut	2291a111124	1
Klenk	Raspberry leaves, cut	12273107	1
Klenk	Raspberry leaves, cut	2291A130320	1
Klenk	Raspberry leaves, cut	2291A121120	4
Klenk	Raspberry leaves, cut	2291A120806	6
Klenk	Raspberry leaves, cut	2291A120813	1
Klenk	Red clover flower	811Q-07163	1
Klenk	Red clover flower	1640A110727	3
Klenk	Red clover flower	1640A130122	14
Klenk	Red clover flower	1640a130122	1
Klenk	Red clover flower	nachprüfung	3
Klenk	Red clover flower	7470A130311	1
Klenk	Red clover flower	1640A120116	1
Klenk	Redwood	5961B111219	1
Klenk	Restharrow root, cut	6411B111110	3
Klenk	Restharrow root, cut	B111110	1
Klenk	Restharrow root, cut	6411B130404	3
Klenk	Restharrow root, cut	6411B101216	2
Klenk	Restharrow root, cut	4296345	1
Klenk	Restharrow root, cut	6411111110	1
Klenk	Rhubarb root, cut	6891B111118	1
Klenk	Rhubarb root, cut	7761B130514	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Rose flower	1561A121016	1
Klenk	Rose flower leaves, cut	1561B101210	3
Klenk	Rose flower leaves, cut	1561A110404	1
Klenk	Rose flower leaves, cut	1561A121016-34023101	1
Klenk	Rosehip	3613M-01542	1
Klenk	Rosehip	2841B110317	1
Klenk	Rosehip	B130523	1
Klenk	Rosehip	A120904	1
Klenk	Rosehip	B111019	1
Klenk	Rosehip	2841B081210	1
Klenk	Rosehip	A120719	1
Klenk	Rosehip peel, cut	A120904	3
Klenk	Rosehip peel, cut	2851A150310	1
Klenk	Rosehip peel, cut	2841B111019	2
Klenk	Rosehip peel, cut	3613M-01543	1
Klenk	Rosehip peel, cut	2851A120904	2
Klenk	Rosehip peel, cut	2851A-110202	1
Klenk	Rosehip peel, cut	2851A120102	5
Klenk	Rosehip peel, cut	2851A101119	2
Klenk	Rosemary leaves, cut	61A131118	1
Klenk	Rosemary leaves, cut		1
Klenk	Rosemary leaves, cut	2261A150622	2
Klenk	Rosemary leaves, cut	A130201	2
Klenk	Rosemary leaves, cut	2261a130201	1
Klenk	Rosemary leaves, cut	2261a120224	4
Klenk	Rosemary leaves, cut	2261A081117	1
Klenk	Rosemary leaves, cut	2261A130201	29
Klenk	Rosemary leaves, cut	2261A131118	8
Klenk	Rosemary leaves, cut	2261A120224	22
Klenk	Rosemary leaves, cut	2261A140910	2
Klenk	Rosemary leaves, cut	112E-01510	1
Klenk	Rosemary leaves, cut	2261A100916	2
Klenk	Rue herb, cut	A120207	1
Klenk	Rue herb, cut	4361A07020601	1
Klenk	Rue herb, cut	4361A120207	1
Klenk	Rue herb, cut	4361A100707	3
Klenk	Saffron (spice)	384A110608	1
Klenk	Saffron (spice)	384A130320	2
Klenk	Saffron (spice)	384a120410	1
Klenk	Saffron (spice)	384A-120410	1
Klenk	Saffron strands	380A120416	2
Klenk	Saffron strands	380a130613	1
Klenk	Saffron strands	380A130613	1
Klenk	Saffron strands	380a120416	1
Klenk	Sage leaves, cut	2301C12126	1
Klenk	Sage leaves, cut	2301c120126	2
Klenk	Sage leaves, cut	2301a120403	2
Klenk	Sage leaves, cut	2301C12026	1
Klenk	Sage leaves, cut	2310A120403	1
Klenk	Sage leaves, cut	2301A100726	1
Klenk	Sage leaves, cut	C120126	1
Klenk	Sage leaves, cut	2301A110420	1
Klenk	Sage leaves, cut	2301C120126	16
Klenk	Sage leaves, cut	21021313	1
Klenk	Sarsaparilla, cut	B111108	1
Klenk	Sarsaparilla, cut	6561B111108	2
Klenk	Seaweed, cut	1051A110920	1
Klenk	Senna leaves, cut	2331B130214	4
Klenk	Senna leaves, cut	2331C130326	14
Klenk	Senna leaves, cut	2331B120521	5

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Senna leaves, cut	2331C120614	11
Klenk	Senna leaves, cut	B130214	1
Klenk	Senna leaves, cut	2331A110207	2
Klenk	Senna leaves, cut	2331A100525	2
Klenk	Senna leaves, cut	2331B120403	4
Klenk	Senna leaves, cut	2331B110907	2
Klenk	Senna leaves, cut	2331c130326	2
Klenk	Senna leaves, cut	2331b130214	1
Klenk	Senna leaves, cut	2331B150903	1
Klenk	Shepherd's purse herb...	3671A-100414	2
Klenk	Shepherd's purse herb...	B111201	1
Klenk	Shepherd's purse herb...	3671B111201	1
Klenk	Siberien ginseng root...	7011A110714	1
Klenk	Siberien ginseng root...	7011A101206	1
Klenk	Siberien ginseng root...	7011A121204	1
Klenk	Silverweed, cut	H-280513-3	1
Klenk	Silverweed, cut	3551A110913	2
Klenk	Silverweed, cut	3551A130903	1
Klenk	Silverweed, cut	A110913	2
Klenk	Sodium dihydrogen pho...	1301005-01	1
Klenk	Sodium hydrogen carbo...	12d11-n02	1
Klenk	Sorrel herbs, cut	11165306	1
Klenk	Southernwood root	6194B110831	1
Klenk	Southernwood root	6191B130228	2
Klenk	Southernwood root	12097301	1
Klenk	Southernwood root	6191B120726	5
Klenk	Southernwood root	6191b120726	3
Klenk	Southernwood root	69191B120726	1
Klenk	Southernwood, cut	26011403	1
Klenk	Southernwood, cut	21081301	1
Klenk	Southernwood, cut	3451a120312	2
Klenk	Southernwood, cut	3451A120312	21
Klenk	Southernwood, cut	pzn4288802	1
Klenk	Spearmint, cut	2171A120711	1
Klenk	Speedwell wort, cut	nachprüfung	1
Klenk	Speedwell wort, cut	4661C-111011	1
Klenk	Speedwell wort, cut	4661C13026	1
Klenk	Speedwell wort, cut	C120321	1
Klenk	Speedwell wort, cut	4661B110916	2
Klenk	Speedwell wort, cut	4661C131104	1
Klenk	Speedwell wort, cut	4661B101011	1
Klenk	Speedwell wort, cut	4661C130226	24
Klenk	Speedwell wort, cut	4661C120802	14
Klenk	Speedwell wort, cut	4661c120802	1
Klenk	Speedwell wort, cut	4661C111011	17
Klenk	Speedwell wort, cut	4661C130226-32743106	1
Klenk	Speedwell wort, cut	4661c120321	1
Klenk	Speedwell wort, cut	4661A090318	1
Klenk	Speedwell wort, cut	4661C2004	1
Klenk	Speedwell wort, cut	4661c130226-34343111	1
Klenk	St. John's wort, cut	15068103	2
Klenk	St. John's wort, cut	4021A100919	1
Klenk	St. John's wort, cut	4021a120604	1
Klenk	St. John's wort, cut	268913	2
Klenk	St. John's wort, cut	A130612	3
Klenk	St. John's wort, cut	4021B110321	1
Klenk	St. John's wort, cut	4021A100819	22
Klenk	St. John's wort, cut	A121120	1
Klenk	St. John's wort, cut	4021A120905	4
Klenk	St. John's wort, cut	4021A00819	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	St. John's wort, cut	4021A100819914	2
Klenk	St. John's wort, cut	4021A130612	3
Klenk	St. John's wort, cut	4021a100819	1
Klenk	Star anise	B111109	1
Klenk	Star anise	2690A120809	1
Klenk	Star anise	2690A111013	3
Klenk	Star anise	2690A101026	2
Klenk	Star anise	2695B120308	1
Klenk	Star anise	2690A130903	2
Klenk	Star anise	2696B111109	1
Klenk	Strawberry leaves, cut	2031A130430	2
Klenk	Strawberry leaves, cut	2031B110224	2
Klenk	Strawberry leaves, cut	A130430	1
Klenk	Strawberry leaves, cut	B120925	1
Klenk	Sunflower flower, cut	1701B091013	1
Klenk	Sweet fennel	2870A140528	1
Klenk	Sweet fennel	2870A130304	3
Klenk	Sweet fennel	2870A131002	1
Klenk	Sweet fennel	2870130304A	1
Klenk	Tetterwort, cut	nachprüfung	1
Klenk	Tetterwort, cut	3731A130904	1
Klenk	Tetterwort, cut	3731A-110301	1
Klenk	Tetterwort, cut	3731B100205	1
Klenk	Tetterwort, cut	3731K120904	4
Klenk	Tetterwort, cut	1406111632	1
Klenk	Tetterwort, cut	4711E-01632	1
Klenk	Tetterwort, cut	3731A110301	11
Klenk	Theriac, powdered	12189403	1
Klenk	Thyme, rubbed	1005	1
Klenk	Thyme, rubbed	2902211688	1
Klenk	Thyme, rubbed	4622A120111	54
Klenk	Thyme, rubbed	4622A141203	1
Klenk	Thyme, rubbed	4622A1200111	1
Klenk	Thyme, rubbed	1910211688	1
Klenk	Thyme, rubbed	4622A130109	81
Klenk	Thyme, rubbed	4622a110728	2
Klenk	Thyme, rubbed	4622B110519	3
Klenk	Thyme, rubbed	2103311688	1
Klenk	Thyme, rubbed	4622a120111	4
Klenk	Thyme, rubbed	4622A-120111	1
Klenk	Thyme, rubbed	4622a130109	3
Klenk	Thyme, rubbed	4622A130910	2
Klenk	Thyme, rubbed	A130910	3
Klenk	Thyme, rubbed	11121307	1
Klenk	Tinnevelly senna fruit	1041B120327	1
Klenk	Tormentil rhizome	6914b120112	1
Klenk	Tormentil rhizome	6911B150825	1
Klenk	Tormentil rhizome	6911B141114	1
Klenk	Tormentil rhizome	6911B131029	4
Klenk	Tormentil rhizome	6911B111013	9
Klenk	Trichloroacetic acid	11294318	2
Klenk	Turnera diffusa herb,...	1990A130206	1
Klenk	Turnera diffusa herb,...	A130206	2
Klenk	Turnera diffusa herb,...	12064101	1
Klenk	Valerian root, cut	6641B-110317	1
Klenk	Valerian root, cut	6641B100823	1
Klenk	Valerian root, cut	6645B130226	1
Klenk	Valerian root, cut	13196808	1
Klenk	Valerian root, cut	6641B120417	3
Klenk	Valerian root, cut	6641B130226	10

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Vervain herb, cut	A130923	1
Klenk	Vervain herb, cut	4651A070828	3
Klenk	Vervain herb, cut	12345	1
Klenk	Vervain herb, cut	4651B130611	2
Klenk	Vervain herb, cut	4651B110310	3
Klenk	Vervain herb, cut	4651B120611	18
Klenk	Vine leaves, cut	2491B100707	1
Klenk	Violet root	B130102	1
Klenk	Violet root	B111013	1
Klenk	Violet root	6831B111013	1
Klenk	Walnut leaves, cut	2111A110816	1
Klenk	Walnut leaves, cut	F-280513-1	1
Klenk	Walnut leaves, cut	A130410	1
Klenk	Walnut leaves, cut	2111A130410	4
Klenk	Walnut leaves, cut	2111A-120123	1
Klenk	Walnut leaves, cut	2111A131029	1
Klenk	Walnut shells, cut	711b120613	1
Klenk	Walnut shells, cut	711B111020	6
Klenk	Walnut shells, cut	7114B120906	1
Klenk	Walnut shells, cut	711B110128	1
Klenk	Walnut shells, cut	711B080806	1
Klenk	Walnut shells, cut	711B120613	1
Klenk	Walnut shells, cut	711B120906	2
Klenk	Wild oregano herb	4221A120315	2
Klenk	Willow bark, cut	811B100910	4
Klenk	Willowherb, small-flo...	2512U-01641	1
Klenk	Willowherb, small-flo...	4721A101010	4
Klenk	Willowherb, small-flo...	C120321	1
Klenk	Willowherb, small-flo...	4721C2120321	2
Klenk	Willowherb, small-flo...	4721C110701	4
Klenk	Willowherb, small-flo...	4721C130618	4
Klenk	Willowherb, small-flo...	4721B130528	1
Klenk	Willowherb, small-flo...	4721A120903	7
Klenk	Willowherb, small-flo...	4721A120418	7
Klenk	Witch hazel leaves, cut	2051B110214	1
Klenk	Witch hazel leaves, cut	B110214	1
Klenk	Woodruff herb, cut	3601B090114	1
Klenk	Woodruff herb, cut	B090114	3
Klenk	Woodruff herb, cut	3601B140321	1
Klenk	Wormwood herb, cut	3461A121130	2
Klenk	Wormwood herb, cut	A110324	1
Klenk	Wormwood herb, cut	3461A110324	2
Klenk	Wormwood herb, cut	3461A1100324	1
Klenk	Yarrow flower, rubbed	1511A111129	1
Klenk	Yarrow flower, rubbed	4181A121130	1
Klenk	Yarrow flower, rubbed	A110816	3
Klenk	Yarrow herb, cut	A130709	1
Klenk	Yarrow herb, cut	4181A130710	1
Klenk	Yarrow herb, cut	4181a130513	1
Klenk	Yarrow herb, cut	4181a11011	1
Klenk	Yarrow herb, cut	4181A111122	4
Klenk	Yarrow herb, cut	4181A110111	19
Klenk	Yarrow herb, cut	4181A101102	3
Klenk	Yarrow herb, cut	4181130709	1
Klenk	Yarrow herb, cut	15333007	1
Klenk	Yarrow herb, cut	4181A130513	11
Klenk	Yarrow herb, cut	4181A121130	14
Klenk	Yarrow herb, cut	4181B130709	2
Klenk	Zedoary rhizome, cut	6941B121025	2
Klenk	Zedoary rhizome, cut	6941B110329	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Klenk	Zedoary rhizome, powd...	12007505	1
Koisser	Glucosamine sulfate 2...	120719K371	1
Kräuter Sc	Wood betony herb, cut	38546	1
kräuter schulte	Bitter orange peel, cut	51265	1
kräuter schulte	Gentian root, cut	52348	1
kräuter schulte	Rose flower leaves, cut	47543	1
kräuter schulte	Tormentil rhizome	51952	1
Kräuter Schulte	Black cohosh rhizome,...	3308M-02176	1
Kräuter Schulte	Blackthorn flower, ru...	53233	2
Kräuter Schulte	China Pai Mu Tan (whi...	52783	1
Kräuter Schulte	Colewort, cut	51737	1
Kräuter Schulte	Couchgrass root rhizo...	53016	2
Kräuter Schulte	Dill seeds	6363	1
Kräuter Schulte	Mountain avens, cut	38970	1
Kräuter Schulte	Pu-erh tea (red tea)	52029	1
Kräuter Schulte	Red clover flower	53778	1
Kräuter Schulte	Round leaf buchu leaves	54519	1
Kräuter Schulte	Soap root, red, cut	54524	2
Kräuter Schulte	Soap root, red, cut	54977	1
Kräuter Schulte	Southernwood, cut	50870	1
Kräuter-Schulte	Peppermint leaves, cut	56254	1
Kräuter-Schulte	Sorrel herbs, cut	55272	1
Kräuter-Schulte	Woodruff herb, cut	52878	1
Kräuter-Schulte	Zedoary rhizome, cut	25713	1
linnea/salficalcan	Griffonia seed extract	50814001	1
Lohman	Sodium sulfate decahy...	1210005-02	3
Lycored	Caromix	CMXVBAF-011301	1
Macfarlan Smith/Noweda	Cocaine hydrochloride	15224802	1
Magnesia/ Noweda	Magnesium sulfate hep...	26251	3
meltem	Sweet fennel	türkei	1
Merck	Codeine phosphate hem...	120765	1
Merck	Heavy alkaline bismut...	75419201	1
Merck	Trichloroacetic acid	12821	1
Microsin Pharmorgana	Copper orotate dihydr...	565313	1
Microsin Pharmorgana	Zinc orotate dihydrate	0RZ00113	1
Nachprüfung	Anise	5010U-01530	1
Nachprüfung	Black cohosh rhizome,...	10281113	1
Nachprüfung	Blackcurrant leaves, ...	1003	1
Nachprüfung	Erica herb, cut	5110A03224	1
Nachprüfung	Fenugreek seeds, powd...	2412E02239	1
Nachprüfung	Hay flowers	1911E01459	1
Nachprüfung	Pansy herb, cut	10291007	1
Nachprüfung	Potassium hydrocarbon...	1105	1
Nachprüfung	Southernwood, cut	3451A070919	1
noweda	Anise	11101201	3
noweda	Dandelion root, cut		1
noweda	Iceland moss, cut		1
noweda	Lavender flower	11327904	1
noweda	Nettle leaves, cut	10291404	1
noweda	Valerian root, cut	11103603	1
noweda	Walnut leaves, cut		1
noweda	Wormwood herb, cut	11085709	1
Noweda	Agrimony herb, cut	9300106	1
Noweda	Ammonium hydrogen car...	11145601	3
Noweda	Angelica root	12070802	1
Noweda	Angelica root	272720	2
Noweda	Angelica root	38011111	2
Noweda	Anise	521103501	1
Noweda	Anise	11101203	10
Noweda	Bay leaves	12299101	2

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Noweda	Bean-pods, cut	265670	1
Noweda	Bearberry leaves, cut	267926	2
Noweda	Bearberry leaves, cut	11213011	6
Noweda	Bentonite	11304415	1
Noweda	Bentonite	1301012-01	1
Noweda	Birch leaves, cut	11189508	2
Noweda	Birch leaves, cut	12193004	5
Noweda	Birch leaves, cut	12193105	4
Noweda	Bitter fennel	12094707	1
Noweda	Bitter orange flower ...	11049211	1
Noweda	Black mustard seed, p...	12350204	4
Noweda	Boldo leaves, cut	11016507	1
Noweda	Calamus rhizome, peeled	6701B120427	7
Noweda	Calcium hydrogen phos...	11287501	2
Noweda	Cape aloe, powdered	11132104	1
Noweda	Caraway, crushed	12116904	3
Noweda	Clubmoss herb, cut	9378808	1
Noweda	Clubmoss herb, cut	11050001	1
Noweda	Common centaury, cut	10104012	2
Noweda	Copper (II) sulfate p...	12B09-N10	1
Noweda	Copper (II) sulfate p...	11F21-N03	1
Noweda	Coriander	13010302	4
Noweda	Coriander	12080902	1
Noweda	Dandelion herb with r...	11217101	1
Noweda	Dandelion herb with r...	521101126	1
Noweda	Dandelion herb with r...	11030311	5
Noweda	Dandelion herb with r...	11030305	3
Noweda	Dithranole	APDT/375/2012	1
Noweda	Dithranole	DT/375/2012D	3
Noweda	Golden rot wort, cut	11207014	2
Noweda	Golden rot wort, cut	11280306	4
Noweda	Hawthorn leaves with ...	11366001	2
Noweda	Hawthorn leaves with ...	10273515	6
Noweda	Hibiscus flower	11036507	2
Noweda	Hop strobile	274725	1
Noweda	Hop strobile	12008313	1
Noweda	Horehound herb, cut	4141A080513	1
Noweda	Horse chestnut leaves...	11063501	1
Noweda	Horse chestnut leaves...	11063502	2
Noweda	Horsetail herbs, cut	11021904	3
Noweda	Horsetail herbs, cut	10375511	1
Noweda	Iceland moss, cut	11101602	1
Noweda	Indian psyllium	7560A110125	1
Noweda	Juniper berries	521101635	1
Noweda	Juniper berries	2890A101201	5
Noweda	Lady's mantle herb, cut	1215301	1
Noweda	Lime flower, cut	12170702	4
Noweda	Lime flower, cut	10273608	3
Noweda	Liquorice root, peeled	521200852	1
Noweda	Liquorice root, peeled	70226/1	1
Noweda	Magnesium chloride he...	11H01-N03	1
Noweda	Magnesium sulfate hep...	11H29-N02	3
Noweda	Manna, cut	5221A110817	2
Noweda	Manna, powdered	11170102	1
Noweda	Marian thistle herb, ...	10315905	1
Noweda	Marigold flower, cut	268876	1
Noweda	Marigold flower, cut	12221709	7
Noweda	Marshmallow leaves, cut	13199604	4
Noweda	Matricaria flower	11169603	2
Noweda	Matricaria flower	12111903	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Noweda	Melissa leaves, cut	10310913	1
Noweda	Milkvetch, powdered	12108807	1
Noweda	Milkvetch, powdered	11128910	1
Noweda	Molecular distilled g. . .	11160010	1
Noweda	Monk's pepper fruit	12016902	2
Noweda	Nettle leaves, cut	10375901	5
Noweda	Nettle leaves, cut	262338	1
Noweda	Nettle leaves, cut	41010712	1
Noweda	Nystatin	1207009-01	9
Noweda	Oak bark, cut	10348617	10
Noweda	Oat straw, cut	11280003	1
Noweda	Ortisophon leaves, cut	2221B101213	2
Noweda	Parsley seeds	7370A091120	5
Noweda	Passionflower herb, cut	10079510	1
Noweda	Peppermint leaves, cut	11294411	2
Noweda	Peppermint leaves, cut	2911U-01505	1
Noweda	Plantain leaves, cut	251029	1
Noweda	Plantain leaves, cut	10315712	4
Noweda	Potassium hydrocarbon. . .	1004019-01	1
Noweda	Prednisolone 1:10 (ri. . .	11L13-N06	1
Noweda	Primrose root, cut	12064504	7
Noweda	Raspberry leaves, cut	12103101	11
Noweda	Restharrow root, cut	272831	3
Noweda	Restharrow root, cut	11103102	1
Noweda	Rhubarb root, cut	6891B100421	1
Noweda	Rosehip peel, cut	275394	3
Noweda	Sage leaves, cut	11347511	9
Noweda	Sage leaves, cut	11056119	2
Noweda	Senna leaves, cut	11277305	2
Noweda	Shepherd's purse herb. . .	11036409	1
Noweda	Sodium hydrogen carbo. . .	11197801	1
Noweda	Southernwood root	11198101	1
Noweda	Theriac, powdered	11082404	1
Noweda	Thyme, rubbed	11345002	4
Noweda	Thyme, rubbed	11345007	6
Noweda	Thyme, rubbed	11345014	17
Noweda	Thyme, rubbed	521303908	1
Noweda	Tonka beans	1040A111026	1
Noweda	Turnera diffusa herb, . . .	200151	1
Noweda	Valerian root, cut	11103609	6
Noweda	Walnut leaves, cut	10050416	2
Noweda	Walnut leaves, cut	10050414	1
Noweda	Willow bark, cut	4609A-01305	1
Noweda	Willowherb, small-flo. . .	10326106	3
Noweda	Yarrow herb, cut	12378603	1
Noweda	Zedoary rhizome, cut	11091605	4
Noweda 06.04.2016	Bitter fennel	15443201	1
Noweda 06.04.2016	Tormentil rhizome	15178202	1
Otto Fischer GmbH	Sodium hydrogen carbo. . .	6521021	1
Phagron/Ph	Aluminium chloride he. . .	11I23-N06	1
Pharmachem.Pöfneck/Ph. . .	Amphetamine sulfate	13G08-N11	4
Pharmorgana	Caromix	cmx-PL101112	1
Pharmorgana	Copper orotate dihydr. . .	CH-565313	1
Phoenix	Aluminium chloride he. . .	11/23-N06	4
Phoenix	Aluminium chloride he. . .	13D22-N09	34
Phoenix	Elder flower, rubbed	10291309	3
Phoenix	Fenugreek seeds	11313206	5
Phoenix	Gentian root, cut	6311B120104	1
Phoenix	Golden rot wort, cut	265283	2
Phoenix	Juniper berries		1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phoenix	Magnesium sulfate hep. . .	12L10-N07	14
Phoenix	Manna, cut	522A120509	1
Phoenix	Methadone hydrochloride	15244715	1
Phoenix	Potassium hydrocarbon. . .	12141915	5
Phoenix	Raspberry leaves, cut	10136409	1
Phoenix	Sage leaves, cut	231C130326	1
Phoenix	Sodium hydrogen carbo. . .	13B18-N03	1
Phoenix	Zedoary rhizome, cut	13010104	2
PHOENIX 19.05.2014	Black pepper	13221105	1
Phoenix 23.11.12	Horsetail herbs, cut	12288801	10
Phoenix 27.03.2012	Flaxseeds	11177302	1
Phoenix am 03.12.2010	Bearberry leaves, cut	4910B-1518	1
PHOENIX am 08.06.2012	Mugwort herb, cut	12016703	1
Phoenix am 11.06.2012	Sage leaves, cut	2301A110204	11
PHOENIX am 14.05.2012	Artichoke leaves, cut	11151905	1
Phoenix am 30.01.2013	Matricaria flower	1290A	1
Phoenix, 04.09.2012	Nettle leaves, cut	12195002	4
Phoenix, 13.09.2012	Thyme, rubbed	44622A120111	1
Phonix	Flaxseeds	13296703	3
Phönix	Aluminium chloride he. . .	12/27-N01	7
Phönix	Aluminium potassium s. . .	14263801	1
Phönix	Aluminium potassium s. . .	110804902	1
Phönix	Amphetamine sulfate	13B11N04	1
Phönix	Birch leaves, cut	1901120802	1
Phönix	Bitter fennel	15006501	1
Phönix	Cinnamon bark, sticks	610A130927	1
Phönix	Coltsfoot leaves, cut	278296	2
Phönix	Common broom herb, cut	12358801	2
Phönix	Common centaury, cut	11093612	2
Phönix	Creatine	mysjhskeu	1
Phönix	Dandelion herb with r. . .	6611B110131	2
Phönix	Flaxseeds	7307A111107	13
Phönix	Gentian root, cut	269197	2
Phönix	Gentian root, cut	6311B120315	8
Phönix	Ginger rhizome, peeled	13310601	1
Phönix	Horsetail herbs, cut	12288807	2
Phönix	Hyssop herb, cut	11374306	1
Phönix	Ivy leaves, cut	11101102	1
Phönix	Juniper berries	13020903	1
Phönix	Lime flower, cut	1611A12120	1
Phönix	Liquorice root, unpee. . .	276425	1
Phönix	Matricaria flower	1300A120426	1
Phönix	Melilot herb, cut	1237903	1
Phönix	Melissa leaves, cut	2161A150324	1
Phönix	Nystatin	12017005	3
Phönix	Oak bark, cut	10348609	3
Phönix	Ortisophon leaves, cut	12225701	1
Phönix	Peppermint leaves, cut	2181A141016	1
Phönix	Rhubarb root, cut	12211905	5
Phönix	Rosehip	2841B130523	1
Phönix	Rosehip	10281021	1
Phönix	Rosehip	2841B130523	1
Phönix	Silverweed, cut	11328107	6
Phönix	Sodium carbonate deca. . .	13036904	2
Phönix	Sodium hydrogen carbo. . .	206027	2
Phönix	Sodium hydrogen carbo. . .	13390515	1
Phönix	Sodium monohydrogenph. . .	1302800,	1
Phönix	Sodium monohydrogenph. . .	13028101	1
Phönix	Speedwell wort, cut	13089201	4
Phönix	Talcum powder	10148805Retest	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Phönix	Wormwood herb, cut	12355806	4
Phönix	Yarrow herb, cut	1237962	1
Phönix	Yarrow herb, cut	13029103	18
Phönix	Aluminium potassium s...	13356108	1
Phönix 04.03.13	Soap root, red, cut	6561B111108	1
Phönix 05.10.2012	Marigold flower, cut	121005	1
Phönix 05.10.2012	Walnut leaves, cut	121005	1
Phönix 08.08.2012	Caraway	1103213	1
Phönix 10.01.2014	Senna leaves, cut	13136707	1
Phönix 10.07.2013	Mugwort herb, cut	12016711	3
Phönix 12.10.13	Common knotgrass herb...	12368906	3
Phönix 18.10.2013	Sodium dihydrogen pho...	12198512	1
phönix 22.01.2013	Yarrow herb, cut	271873	1
Phönix 23.08.2012	Bearberry leaves, cut	23910B120314	1
Phönix 24.09.2012	Mistletoe herb, cut	120924	1
Phönix 27.03.2013	Calcium chloride dihy...	1107010-02	1
Phönix 31.10.12	Passionflower herb, cut	12031701	2
Phönix Gotha	Goat's rue herb, cut	11307905	1
Phönix Gotha	Marjoram herb, rubbed	11212709	1
Phönix Gotha	Nystatin	4014941	1
Phönix Gotha	Sodium monohydrogenph...		1
Phönix Gotha	Sodium thiosulfate pe...	10E07-N13	1
phönix, 13.06.2012	Calcium chloride dihy...	11230918	1
phönix, 14.01.2013	Hop strobile	130114	1
Phönix, 15.01.2013	Aluminium potassium s...	12I24-M03	1
Phönix/	Lady's mantle herb, cut	14066009	2
Phönix/	St. John's wort, cut	14065707	1
Phönix/Euro	Magnesium chloride he...	1208025-01	2
Productos Quimicos	D-(+)-mannose	16000524	1
Purren Apotheke	Heavy alkaline bismut...	11H31-N06	1
Richter	Corn silk, cut	B189316	1
Richter	Elfwort root, cut	P158683	1
Richter	Gentian root, cut	P200907	1
Richter	Ground ivy herb, cut	s99/09	1
Richter	Lungwort herb, cut	P195884	1
Richter	Mugwort herb, cut	b200112	1
Richter	Tormentil rhizome	P209904	1
Safic	Amygdalin	12121302	1
Safic Alcan	Amygdalin	150117	1
SAFICALCAN	Amygdalin	Test3.3.14	1
SAFICALCAN	Amygdalin	BatchATA08041002	1
SAFICALCAN	Amygdalin	120141701	1
SAFICALCAN	Amygdalin	13041202/1.Tonne	1
SAFICALCAN	Amygdalin	13041202/2.Tonne	1
SAFICALCAN	Dimercaptosuccinic acid	20140618	1
SAFICALCAN	Glycyrrhizic acid	11592	1
Safic-Alcan Deutschla...	Amygdalin	17937-AA/1	1
Safic-Alcan Deutschla...	Amygdalin	18012-AD/1	1
Salfic-Alcan	Amygdalin	BAE-150610	2
Salfic-Alcan	Amygdalin	NSMPK06211-BAE	1
sanacorp	Anise	15398602	3
sanacorp	Artichoke leaves, cut	12173301	1
sanacorp	Bittersweet stalks, cut	9354603	1
sanacorp	Caraway	2656259	1
sanacorp	Corn silk, cut	10034711	1
sanacorp	Dandelion herb with r...	11030310	1
sanacorp	Liquorice root, peeled	11351913	1
sanacorp	Mallow flower, cut	10357906	1
sanacorp	Marjoram herb, rubbed	11212701	1
sanacorp	Melilot herb, cut	10335409	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
sanacorp	Mullein flower, cut	11020706	1
sanacorp	Nettle leaves, cut	12184705	1
sanacorp	Rose flower leaves, cut	10306512	1
sanacorp	Rosehip	10281015	1
sanacorp	Rosemary leaves, cut	12221705	1
sanacorp	Shepherd's purse herb...	11010505	1
sanacorp	Vervain herb, cut	12188201	1
Sanacorp	Aluminium chloride he...	1210014-02	24
Sanacorp	Bearberry leaves, cut	2391B110209	3
Sanacorp	Bilberry leaves, cut	2191A130410	1
Sanacorp	Blackcurrant leaves, ...	2251A110204	2
Sanacorp	Caraway		2
Sanacorp	Clubmoss herb, cut	13101502	2
Sanacorp	Dandelion herb with r...	13108803	3
Sanacorp	Feverfew, cut	12380201	3
Sanacorp	Genuine cleaver's her...	12369003	10
Sanacorp	Genuine golden rot wo...	12343103	1
Sanacorp	Goat's rue herb, cut	12017911	1
Sanacorp	Hibiscus flower	12267508	2
Sanacorp	Hyssop herb, cut	13336101	6
Sanacorp	Lime flower, cut	264045	1
Sanacorp	Matricaria flower	1300A120725	2
Sanacorp	Methadone hydrochloride	12171913	1
Sanacorp	Methadone hydrochloride	12344806	2
Sanacorp	Monk's pepper fruit	12274008	1
Sanacorp	Nettle root, cut	11265001	2
Sanacorp	Nettle seeds	13010602	1
Sanacorp	Pansy herb, cut	12221-01694	1
Sanacorp	Pansy herb, cut	278106	1
Sanacorp	Raspberry leaves, cut	13038001	7
Sanacorp	Raspberry leaves, cut	13101604	2
Sanacorp	Seaweed, cut	11351105	1
Sanacorp	Senna leaves, cut	13136701	2
Sanacorp	Sodium hydrogen carbo...	12D11-N02	15
Sanacorp	Sodium monohydrogenph...	12345013	5
Sanacorp	Tormentil rhizome	12040712	3
Sanacorp	Wood betony herb, cut	13048903	4
Siegfried Ltd, Divisi...	Methadone hydrochloride	15244712	1
Sigma-Aldrich	Sodium butyrate	Lot .091M-5302V	1
Sigma-Aldrich	Sodium propionate	SLBK5249V	1
Sino Phyto	Myrrh	90001070	1
Sino Phyto	Rosehip peel, cut	1290142	1
Spangro/gepepharm	Bitter fennel	15007602	1
Spangropharm	Matricaria flower	11169606	2
Spangropharm	Mistletoe herb, cut	10273408	1
Spinnrad	Black cumin seed	11931059	1
Spinnrad/Phoenix	Black cumin seed	613310592	1
Stefes	Tocomax 20%	30613	1
Stefes	Tocomax 20%	111013	1
stumpf	Magnesium chloride he...	1301c012-277804	1
Symrise	D-(+)-mannose		1
Synopharm am 10.09.2012	Methadone hydrochloride	12B21-No3	1
Testmessung	Amygdalin	13011101	1
Testmessung	Amygdalin	13041202	1
Testmessung	Amygdalin	13041201	3
Th. Geyer	Amphetamine sulfate	67043	9
Th. Geyer	Amphetamine sulfate	67002	48
Th. Geyer	Amphetamine sulfate	56047	1
Th. Geyer	Amphetamine sulfate	PH10051	1
Th. Geyer	Calcium colamine phos...	260EXP1016	1

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Th. Geyer	Calcium colamine phos...	7664	1
Th. Geyer	Calcium colamine phos...	14384	2
Th. Geyer	Calcium colamine phos...	33299	1
Th. Geyer	Codeine phosphate hem...	67038	2
Th. Geyer	Dihydrocodeine hydrog...	59819	1
Th. Geyer	Dihydrocodeine hydrog...	67035	2
Th. Geyer	Methadone hydrochloride	67049	1
Th. Geyer	Methadone hydrochloride	67047	3
Th. Geyer	Morphine hydrochloride	67036	5
Th. Geyer	Morphine hydrochloride	PH120087	1
Th. Geyer	Morphine hydrochloride	1415E-01879	1
Th. Geyer	Morphine hydrochloride	2615M-01879	1
Th. Geyer	Phenobarbital	67045	2
unbekannt	Magnesium chloride he...	unbekannt	1
Unisa	Inositol hexanicotinate	22901	1
Unisan	D-ribose	JXCZSJ13D-013	2
VDL	Basil herb, rubbed	12007004	1
VDL	Boldo leaves, cut	11016503	1
VDL	Cudweed flower, cut	10244406	1
VDL	Horsetail herbs, cut	10328914	1
VDL	Primrose flower	11206806	1
vedono	Anise, powdered	11306208	1
vedono	Frankincense granules	12120009	5
vedono	Frankincense granules	12120012	1
vedono	Hibiscus flower	12007313	1
vedono	Rhubarb root, cut	12211907	6
vedono	Wild thyme herb, cut	11374807	2
Weltecke	Meadowsweet herb, cut	67010413	1
Weltecke	Thyme, rubbed	67101212	1
Weltecke / GEHE	Primrose flower	63011112	1
Wolf	Anise	B-671	2
Wolf	Anise	B216346	16
Wolf	Anise	215346	1
Wolf	Anise	B671	1
Wolf	Anise	216346	1
Wolf	Anise	L401F292b	4
Wolf	Anise	L401F1413	1
Wolf	Bitter fennel	B-362	1
Wolf	Bitter fennel	B-493	1
Wolf	Bitter fennel	B-682	1
Wolf	Bitter fennel	B492	1
Wolf	Bitter fennel	B-492	5
Wolf	Bitter fennel	B382	1
Wolf	Bitter fennel	B362	2
Wolf	Black cumin seed	L310F141b	6
Wolf	Black cumin seed		1
Wolf	Black cumin seed	L402F1713	1
Wolf	Black cumin seed	B-471	1
Wolf	Black cumin seed	207204	1
Wolf	Black cumin seed	20720	8
Wolf	Black cumin seed	L402F171b	3
Wolf	Caraway	B-224	1
Wolf	Dill seeds	23622	6
Wolf	Dill seeds	E-501	1
Wolf	Dill seeds	L30057	5
Wolf	Elder flower, rubbed	22765	1
Wolf	Elder flower, rubbed	B-810	1
Wolf	Elder flower, rubbed	22749	2
Wolf	Elder flower, rubbed	E-738	1
Wolf	Horsetail herbs, cut	21879	3

continued on the next page

continued from previous page

Supplier	Substance	Batch	Spectra
Wolf	Horsetail herbs, cut	B233885	2
Wolf	Lady's mantle herb, cut	E-822	1
Wolf	Lady's mantle herb, cut	23187	4
Wolf	Lady's mantle herb, cut	B-698	2
Wolf	Lady's mantle herb, cut	p931	1
Wolf	Lemon grass, cut	B654	1
Wolf	Lemon verbena, cut	E-587	1
Wolf	Lemon verbena, cut	B-312	1
Wolf	Lemon verbena, cut	23635	1
Wolf	Lime flower, cut	22094	1
Wolf	Lime flower, cut	B449	1
Wolf	Marigold flower witho. . .	23342	1
Wolf	Marjoram herb, rubbed	P232243	9
Wolf	Marjoram herb, rubbed	B163516	6
Wolf	Marjoram herb, rubbed	163516	1
Wolf	Matricaria flower	23242	1
Wolf	Nettle leaves, cut	B821	1
Wolf	Nettle leaves, cut	B-821	1
Wolf	Nettle leaves, cut		1
Wolf	Nettle leaves, cut	P234605	10
Wolf	Peppermint leaves, cut	B-725	2
Wolf	Peppermint leaves, cut	B243	1
Wolf	Peppermint leaves, cut	B725	1
Wolf	Peppermint leaves, cut	P221379	7
Wolf	Peppermint leaves, cut	B-185	5
Wolf	Raspberry leaves, cut	P222676	1
Wolf	Raspberry leaves, cut	B-457	1
Wolf	Raspberry leaves, cut	P201727	19
Wolf	Sage leaves, cut	B735	1
Wolf	Shepherd's purse herb. . .	B449	2
Wolf	St. John's wort, cut	B-424	2
Wolf	St. John's wort, cut	B-455	2
Wolf	St. John's wort, cut	B206152	1
Wolf	St. John's wort, cut	19468	2
Wolf	St. John's wort, cut	206152	1
Wolf	Yarrow herb, cut	230010	1
Wolf	Yarrow herb, cut	B230010	9
Xi'An Chongxin Natura. . .	Amygdalin	13031401	1
10.2011	Anise	10247201	1
-	Bitter orange flower . . .	2011A-01445	1
-	Chickweed herb, cut	2011A-01686	1
-	Chicory herb, cut	4411I-01634	1
-	Gentian root, powdered	130063	1
1351 B 111207	Hawthorn flower	1351B111207	4
5N Plus Lübeck GmbH/ . . .	Heavy alkaline bismut. . .	12146908	1
-	Iceland moss, cut	4711E-01774	1
21.08.2013	Marigold flower witho. . .	1241130321	1
-	Meadowsweet herb, cut	130849	1
-	Meadowsweet herb, cut	1511M-01685	1
-	Melilot herb, cut	811Q-01664	1
-	Melissa leaves, cut	131146	1
-	Raspberry leaves, cut	130849	1
-	Silverweed, cut	711M-01619	1
-	Silverweed, cut	130849	1
-	Tetterwort, cut	810I-01632	1
-	Wild thyme herb, cut	130685	1
-	Wild thyme herb, cut	131023	1

Appendix D: Requirements of validation

In order to ensure adherence to the safe scientific status, the individual methods for manufacturing and testing must be validated under certain circumstances (compare § 34 para. 1 no. 3, § 35 para. 1 no. 4 and para. 4 sentence 1 no. 2 b, para. 6 sentence 3 *ApoBetrO* [Pharmacies Rules and Regulations]). The *ApoBetrO* [Pharmacies Rules and Regulations] incorporates a legal definition in § 1 a para. 16 (quotation translated):

“Validation is the provision of documented proof which with a high degree of safety documents that, via a specific process or standard work process, a medicinal product is manufactured and tested, which is in accordance with previously determined quality features.”

Validation documentation can be used to prove that methods or devices which are not described in the Pharmacopoeia within the meaning of § 6 para. 1 sentence 3 *ApBetrO* [Pharmacies Rules and Regulations] achieve the same results as those in the Pharmacopoeia. On the other hand, with the requirements of the demanded validation it must be observed whether the respective testing method is already incorporated in the Pharmacopoeia.

NIR spectroscopy as a general testing method need not be validated in accordance with the express ruling in the *Ph. Eur. Section 1.1* [3], as it is already described in *Section 2.2.40* of the *Ph. Eur.* as an area of application for the identification of raw materials.

However, a special validation requirement exists for the reference database. This requirement is met with the existing document. Further requirements or rules as to how this proof must be furnished do not exist. It is required that the processes guarantee the same results as the methods and devices in the Pharmacopoeia [17].

Carrying out identity tests with *Apo-Ident* is therefore also possible if the NIR spectroscopy process is not required in the Pharmacopoeia monograph of the substance for identity testing. All NIR analyses with *Apo-Ident* prove several, often all molecule groups and are therefore comparable with a series of individual, targeted chemical proofs [4]. Therefore, the identity proof with *Apo-Ident* replaces the monograph test series (with two or more test combinations).

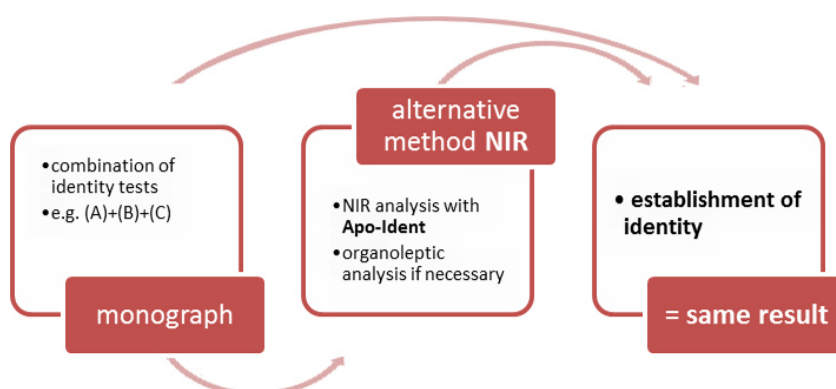


Figure 2: The combination of tests of the monograph is replaced by the alternative method NIR spectroscopy using *Apo-Ident*. This is permissible because both test procedures result in the establishment of the identity of the raw material.

With this validation documentation, proof is furnished that identical results are achieved with *Apo-Ident* and Pharmacopoeia methods, i.e. confirmation of the identity of the raw material [2].

Appendix E: Conformity of Apo-Ident with the European pharmacopeia

According to *Ph. Eur. Section 2.2.40*, NIR spectroscopy is basically suitable for: “Identification of agents, excipients, dosage forms, intermediate manufacturing products, chemical raw materials and packaging materials” ([3], quotation translated).

The fact that *Apo-Ident* meets the further criteria of the European Pharmacopoeia under the headings in *Section 2.2.40*

- Apparatus
- Measurement methods
- Sample preparation and presentation
- Testing the functionality of the instrument
- Identification and characterisation (qualitative analysis)
- Quantitative analysis
- Ongoing model evaluation
- Transfer of databases
- Data storage

can be proven based on the *HiperScan GmbH* documentation of “Meeting 2.2.40 *Ph. Eur.* by *Apo-Ident*” [4].

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

Index

- (R,S)-epinephrine hydrochloride, [1613](#)
 17-alpha-Estradiolum, *see* [Alfatradiol](#)
 3,4-Diaminopyridinum, *see* [3,4-diaminopyridine](#)
 3,4-diaminopyridine, [1617](#)
 5-Fluorouracilum, *see* [5-fluorouracil](#)
 5-aminolevulinic acid hydrochloride, [1621](#)
 5-fluorouracil, [1625](#)
 8-quinolinol sulfate monohydrate, *see* [Quinoline sulfates](#)
 8-quinolinol sulphate monohydrate, *see* [Quinoline sulfates](#)
- Acaciae gummi dispersione desiccatum, *see* [Spray-dried arabic gum](#)
 Acetylcysteine, [25](#)
 Acetylcysteinum, *see* [Acetylcysteine](#)
 Acetylsalicylic acid, [29](#)
 Aciclovir, [33](#)
 Aciclovirum, *see* [Aciclovir](#)
 Acidi aminolevulinici hydrochloridum, *see* [5-aminolevulinic acid hydrochloride](#)
 Acidum acetylosalicylicum, *see* [Acetylsalicylic acid](#)
 Acidum acetylsalicylicum, *see* [Acetylsalicylic acid](#)
 Acidum aminolaevulinicum hydrochloricum, *see* [5-aminolevulinic acid hydrochloride](#)
 Acidum ascorbicum, *see* [Ascorbic acid](#)
 Acidum ascorbinicum, *see* [Ascorbic acid](#)
 Acidum benzoicum, *see* [Benzoic acid](#)
 Acidum boricum, *see* [Boric acid](#)
 Acidum citricum anhydricum, *see* [Citric acid, anhydrous](#)
 Acidum citricum monohydricum, *see* [Citric acid monohydrate](#)
 Acidum folicum, *see* [Folic acid](#)
 Acidum fusidicum, *see* [Fusidic acid](#)
 Acidum fusidicum, *see* [Fusidic acid](#)
 Acidum glutamicum, *see* [Glutamic acid](#)
 Acidum glutaminicum, *see* [Glutamic acid](#)
 Acidum nicotinicum, *see* [Nicotinic acid](#)
 Acidum oxalicum cryst., *see* [Oxalic acid](#)
 Acidum palmitoylascorbinicum, *see* [Ascorbyl palmitate](#)
 Acidum salicylicum, *see* [Salicylic acid](#)
 Acidum sorbicum, *see* [Sorbic acid](#)
 Acidum sorbinicum, *see* [Sorbic acid](#)
 Acidum stearicum, *see* [Stearic acid 50](#)
 Acidum stearinicum, *see* [Stearic acid 50](#)
 Acidum tannicum, *see* [Tannin](#)
 Acidum tartaricum, *see* [Tartaric acid](#)
 Acidum tranexamicum, *see* [Tranexamic acid](#)
- Acidum-(L)-malicum, *see* [L-malic acid](#)
 Adeps solidus, *see* [Waxes / Fats](#)
 Adeps solidus (601), *see* [Hard fat \(601\)](#)
 Adeps solidus W35, *see* [Waxes / Fats](#)
 Adrenalini tartras, *see* [Epinephrine hydrogen tartrate](#)
 Adrenalinum bitartaricum, *see* [Epinephrine hydrogen tartrate](#)
 Adrenalinum racemici hydrochloridum, *see* [\(R,S\)-epinephrine hydrochloride](#)
 Aescin, [37](#)
 Aescinum, *see* [Aescin](#)
 Aethacridinum lacticum monohydricum, *see* [Ethacridine lactate monohydrate](#)
 Aethinyloestradiolum, *see* [Ethinyl estradiol](#)
 Aethylum paraaminobenzoicum, *see* [Benzocaine](#)
- Albendazole, [41](#)
 Albendazolum, *see* [Albendazole](#)
 Alcohol cetylicus, *see* [Cetostearyl alcohol](#)
 Alcohol cetylicus et stearylicus, *see* [Cetostearyl alcohol](#)
 Alcohol cetylicus et stearylicus emulsificans A, *see* [Cetostearyl alcohol](#)
 Alcohol cetylstearylicus, *see* [Cetostearyl alcohol](#)
 Alcohol cetylstearylicus emulsificans A, *see* [Cetostearyl alcohol](#)
 Alcholes adipis lanae, *see* [Wool alcohols](#)
 Alcholes emulsificantes nonionici, *see* [Non-ionic emulsifying alcohol](#)
 Alcholes lanae, *see* [Wool alcohols](#)
 Alfatriadiol, [45](#)
 Alfatriadiolum, *see* [Alfatriadiol](#)
 Allantoin, [51](#)
 Allantoinum, *see* [Allantoin](#)
 Allopurinol, [57](#)
 Allopurinolum, *see* [Allopurinol](#)
 alpha-Tocopheroli acetate pulvis, *see* [alpha-tocopheryl acetate dry concentrate](#)
 alpha-Tocopherolum aceticum siccatum, *see* [alpha-tocopheryl acetate dry concentrate](#)
 alpha-tocopheryl acetate dry concentrate, [61](#)
 Ambroxol hydrochloride, [65](#)
 Ambroxoli hydrochloridum, *see* [Ambroxol hydrochloride](#)
 Ambroxolum hydrochloricum, *see* [Ambroxol hydrochloride](#)
 Amifampridinum, *see* [3,4-diaminopyridine](#)
 Amiloride hydrochloride, [69](#)
 Amiloridi hydrochloridum, *see* [Amiloride hydrochloride](#)

- Amiloridum hydrochloricum, *see* [Amiloride hydrochloride](#)
- Aminoethanolum Ciclopiroxi, *see* [Ciclopirox olamine](#)
- Amphotericin B, [73](#)
- Amphotericinum B, *see* [Amphotericin B](#)
- Amylum Maydis, *see* [Starch](#)
- Amylum oryzae, *see* [Starch](#)
- Amylum Solani, *see* [Starch](#)
- Amylum tritici, *see* [Starch](#)
- Aneurinum hydrochloricum, *see* [Thiamine chloride hydrochloride](#)
- Arginine, [77](#)
- Arginine hydrochloride, [81](#)
- Arginini hydrochloridum, *see* [Arginine hydrochloride](#)
- Argininum, *see* [Arginine](#)
- Argininum hydrochloricum, *see* [Arginine hydrochloride](#)
- Ascorbic acid, [85](#)
- Ascorbyl palmitate, [89](#)
- Ascorbylis palmitas, *see* [Ascorbyl palmitate](#)
- Atropine sulfate, [93](#)
- Atropine sulphate, *see* [Atropine sulfate](#)
- Atropini sulfas, *see* [Atropine sulfate](#)
- Atropinum sulfuricum, *see* [Atropine sulfate](#)
- Bacitracin, [97](#)
- Bacitracinum, *see* [Bacitracin](#)
- Beclometasone dipropionate, anhydrous, [101](#)
- Beclometasoni dipropionas anhydricus, *see* [Beclometasone dipropionate, anhydrous](#)
- Beclometasonum dipropionicum anhydricum, *see* [Beclometasone dipropionate, anhydrous](#)
- Benzocaine, [105](#)
- Benzocainum, *see* [Benzocaine](#)
- Benzoic acid, [111](#)
- Benzydamine hydrochloride, [115](#)
- Benzydamini hydrochloridum, *see* [Benzydamine hydrochloride](#)
- Benzydaminum hydrochloricum, *see* [Benzydamine hydrochloride](#)
- Betaine hydrochloride, [119](#)
- Betaine monohydrate, [123](#)
- Betaini hydrochloridum, *see* [Betaine hydrochloride](#)
- Betainum hydrochloricum, *see* [Betaine hydrochloride](#)
- Betainum monohydricum, *see* [Betaine monohydrate](#)
- Betamethasone dipropionate, micronized, [127](#)
- Betamethasone valerate, [133](#)
- Betamethasone, micronized, [143](#)
- Betamethasoni dipropionas micronisatum, *see* [Betamethasone dipropionate, micronized](#)
- Betamethasoni valeras, *see* [Betamethasone valerate](#)
- Betamethasonum dipropionicum micronisatum, *see* [Betamethasone dipropionate, micronized](#)
- Betamethasonum valerianicum, *see* [Betamethasone valerate](#)
- Betamethasonum, micronisatum, *see* [Betamethasone, micronized](#)
- Bifonazole, [147](#)
- Bifonazolum, *see* [Bifonazole](#)
- Biotin, [151](#)
- Biotinum, *see* [Biotin](#)
- Bismuth gallath, basic, [155](#)
- Bismuthi subgallas, *see* [Bismuth gallath, basic](#)
- Bismutum subgallicum, *see* [Bismuth gallath, basic](#)
- Borax, *see* [Sodium tetraborate](#)
- Boric acid, [161](#)
- Budesonide, micronized, [165](#)
- Budesonidum micronisatum, *see* [Budesonide, micronized](#)
- Butylated hydroxytoluene, [171](#)
- Butylhydroxytoluenum, *see* [Butylated hydroxytoluene](#)
- Butylhydroxytoluolum, *see* [Butylated hydroxytoluene](#)
- Butylscopolaminium bromatum, *see* [Hyoscine butylbromide](#)
- Cacao oleum, *see* [Waxes / Fats](#)
- Caffeine, [175](#)
- Caffeine citrate, [179](#)
- Calcii ascorbas, *see* [Calcium ascorbate](#)
- Calcii ascorbinicum, *see* [Calcium ascorbate](#)
- Calcii citras tetrahydricus, *see* [Calcium citrate tetrahydrate](#)
- Calcii citricum, *see* [Calcium citrate tetrahydrate](#)
- Calcii ethylhydrogenofumaras, *see* [Ethyl hydrogen fumarate calcium](#)
- Calcii ethylhydrogenofumaras, *see* [Ethyl hydrogen fumarate calcium](#)
- Calcii gluconas, *see* [Calcium gluconate](#)
- Calcii gluconicum, *see* [Calcium gluconate](#)
- Calcii glycerinophosphoricum, *see* [Calcium glycerophosphate](#)
- Calcii glycerophosphas, *see* [Calcium glycerophosphate](#)
- Calcii lactas pentahydricus, *see* [Calcium lactate pentahydrate](#)
- Calcii lacticum pentahydricum, *see* [Calcium lactate pentahydrate](#)
- Calcii mupirocini, *see* [Mupirocin calcium](#)
- Calcii orotas, *see* [Calcium orotate dihydrate](#)

- Calcii oroticum, *see* [Calcium orotate dihydrate](#)
- Calcii panthothenas, *see* [Calcium pantothenate](#)
- Calcii panthothenicum, *see* [Calcium pantothenate](#)
- Calcium ascorbate, [183](#)
- Calcium citrate tetrahydrate, [187](#)
- Calcium gluconate, [193](#)
- Calcium glycerophosphate, [197](#)
- Calcium lactate pentahydrate, [201](#)
- Calcium orotate dihydrate, [205](#)
- Calcium pantothenate, [209](#)
- Camphor, [213](#)
- Camphora, *see* [Camphor](#)
- Capsaicin, natural, [219](#)
- Capsaicinoida, *see* [Capsaicin, natural](#)
- Captopril, [223](#)
- Captoprilum, *see* [Captopril](#)
- Carbamidum, *see* [Urea](#)
- Carbomer 35000 / 50000, [227](#)
- Carmellose sodium (400/450/500/600/1600 mPa · s), [233](#)
- Carmellosum natricum (400/450/500/600/1600 mPa · s), *see* [Carmellose sodium \(400/450/500/600/1600 mPa · s\)](#)
- Cellulose, microcrystalline, [237](#)
- Cellulosum microcristallinum, *see* [Cellulose, microcrystalline](#)
- Cellulosum microcristallinum, *see* [Cellulose, microcrystalline](#)
- Cera alba, *see* [Waxes / Fats](#)
- Cera flava, *see* [Waxes / Fats](#)
- Cetostearyl alcohol, [241](#)
- Cetyl alcohol, *see* [Cetostearyl alcohol](#)
- Cetyl palmitate 15, *see* [Waxes / Fats](#)
- Cetyl palmitas 15, *see* [Waxes / Fats](#)
- Cetylum palmicum 15, *see* [Waxes / Fats](#)
- Chinidini sulfas, *see* [Quinidine sulfate dihydrate](#)
- Chinini hydrochloridum, *see* [Quinine hydrochloride](#)
- Chinini sulfas, *see* [Quinine sulfate dihydrate](#)
- Chininum hydrochloricum, *see* [Quinine hydrochloride](#)
- Chininum sulfuricum, *see* [Quinine sulfate dihydrate](#)
- Chinoloni et kalii sulfas, *see* [Quinoline sulfates](#)
- Chloral hydrate, [249](#)
- Chlorali hydras, *see* [Chloral hydrate](#)
- Chloralum hydratum, *see* [Chloral hydrate](#)
- Chloraminum, *see* [Tosylchloramide sodium](#)
- Chloramphenicol, [255](#)
- Chloramphenicolum, *see* [Chloramphenicol](#)
- Chlorhexidine diacetate, [263](#)
- Chlorhexidine dihydrochloride, [269](#)
- Chlorhexidini acetate, *see* [Chlorhexidine diacetate](#)
- Chlorhexidini dihydrochloridum, *see* [Chlorhexidine dihydrochloride](#)
- Chlorhexidinum aceticum, *see* [Chlorhexidine diacetate](#)
- Chlorhexidinum dihydrochloricum, *see* [Chlorhexidine dihydrochloride](#)
- Chlorocresol, [273](#)
- Chlorocresolum, *see* [Chlorocresol](#)
- Chlortetracycline hydrochloride, [277](#)
- Chlortetracyclini hydrochloridum, *see* [Chlortetracycline hydrochloride](#)
- Chlortetracyclinum hydrochloricum, *see* [Chlortetracycline hydrochloride](#)
- Cholecalciferol dry concentrate, [281](#)
- Cholecalciferoli pulvis, *see* [Cholecalciferol dry concentrate](#)
- Cholecalciferolum pulveratum, *see* [Cholecalciferol dry concentrate](#)
- Cholesterinum, *see* [Cholesterol](#)
- Cholesterol, [285](#)
- Cholesterolum, *see* [Cholesterol](#)
- Choline chloride, [289](#)
- Choline hydrogen tartrate, [293](#)
- Cholinii chloridum, *see* [Choline chloride](#)
- Cholinii hydrogenotartras, *see* [Choline hydrogen tartrate](#)
- Cholinium bitartricum, *see* [Choline hydrogen tartrate](#)
- Ciclopirox olamine, [297](#)
- Ciclopirox olaminum, *see* [Ciclopirox olamine](#)
- Ciclosporin, [303](#)
- Ciclosporinum, *see* [Ciclosporin](#)
- Cinchocaine hydrochloride, [307](#)
- Cinchocaini hydrochloridum, *see* [Cinchocaine hydrochloride](#)
- Cinchocainum hydrochloricum, *see* [Cinchocaine hydrochloride](#)
- Cinnarizine, [311](#)
- Cinnarizinum, *see* [Cinnarizine](#)
- Ciprofloxacin hydrochloride, [315](#)
- Ciprofloxacini hydrochloridum, *see* [Ciprofloxacin hydrochloride](#)
- Citric acid monohydrate, [319](#)
- Citric acid, anhydrous, [323](#)
- Citrulline, [335](#)
- Citrullinum, *see* [Citrulline](#)
- Clindamycin hydrochloride, [339](#)
- Clindamycin-2-dihydrogen phosphate, [345](#)
- Clindamycini hydrochloridum, *see* [Clindamycin hydrochloride](#)
- Clindamycini phosphas, *see* [Clindamycin-2-dihydrogen phosphate](#)
- Clindamycinum hydrochloricum, *see* [Clindamycin hydrochloride](#)

- Clindamycinum phosphoricum, *see* [Clindamycin-2-dihydrogen phosphate](#)
- Clioquinol, [349](#)
- Clioquinolum, *see* [Clioquinol](#)
- Clobetasol propionate, [357](#)
- Clobetasoli propionas, *see* [Clobetasol propionate](#)
- Clobetasolum propionicum, *see* [Clobetasol propionate](#)
- Clonidine hydrochloride, [365](#)
- Clonidini hydrochloridum, *see* [Clonidine hydrochloride](#)
- Clonidinum hydrochloricum, *see* [Clonidine hydrochloride](#)
- Clotrimazole, [369](#)
- Clotrimazolum, *see* [Clotrimazole](#)
- Cocoa butter, *see* [Waxes / Fats](#)
- Coffeini citras, *see* [Caffeine citrate](#)
- Coffeinum, *see* [Caffeine](#)
- Coffeinum citricum, *see* [Caffeine citrate](#)
- Colistin sulfate, [379](#)
- Colistin sulphate, *see* [Colistin sulfate](#)
- Colistini sulfas, *see* [Colistin sulfate](#)
- Colistinum sulfuricum, *see* [Colistin sulfate](#)
- Colophonium, *see* [Colophony](#)
- Colophony, [383](#)
- Corn starch, *see* [Starch](#)
- Cyanocobalamin, [387](#)
- Cyanocobalaminum, *see* [Cyanocobalamin](#)
- Cyproterone acetate, [391](#)
- Cyproteroni acetas, *see* [Cyproterone acetate](#)
- Cyproteronum aceticum, *see* [Cyproterone acetate](#)
- Cysteine hydrochloride monohydrate, [395](#)
- Cysteiini hydrochloridum monohydricum, *see* [Cysteine hydrochloride monohydrate](#)
- Cysteinum hydrochloricum, *see* [Cysteine hydrochloride monohydrate](#)
- Cystine, [399](#)
- Cystinum, *see* [Cystine](#)
- D-Galactopyranose, *see* [D-galactose](#)
- D-galactose, [431](#)
- Dapsone, [403](#)
- Dapsonum, *see* [Dapsone](#)
- Deoxycholic acid, [407](#)
- Deoxycholic acidum, *see* [Deoxycholic acid](#)
- Dequalinii chloridum, *see* [Dequalinium chloride](#)
- Dequalinium chloratum, *see* [Dequalinium chloride](#)
- Dequalinium chloride, [411](#)
- Dexamethasone, [417](#)
- Dexamethasone acetate, [423](#)
- Dexamethasoni acetas, *see* [Dexamethasone acetate](#)
- Dexamethasonum, *see* [Dexamethasone](#)
- Dexamethasonum aceticum, *see* [Dexamethasone acetate](#)
- Dextromethorphan hydrobromide monohydrate, [427](#)
- Dextromethorphani hydrobromidum, *see* [Dextromethorphan hydrobromide monohydrate](#)
- Diclofenac sodium, [435](#)
- Diclofenacum natricum, *see* [Diclofenac sodium](#)
- Diltiazem hydrochloride, [441](#)
- Diltiazemi hydrochloridum, *see* [Diltiazem hydrochloride](#)
- Diltiazemum hydrochloricum, *see* [Diltiazem hydrochloride](#)
- Dimethyl fumarate, [449](#)
- Dinatrii edetas, *see* [Sodium edetate](#)
- Diphenhydramine hydrochloride, [453](#)
- Diphenhydramini hydrochloridum, *see* [Diphenhydramine hydrochloride](#)
- Diphenhydraminum hydrochloricum, *see* [Diphenhydramine hydrochloride](#)
- Diphenylcyclopropenone, [457](#)
- Diphenylcyclopropenonum, *see* [Diphenylcyclopropenone](#)
- Diphenylhydrantoinum, *see* [Phenytoin](#)
- Doxycycline hyclate, [461](#)
- Doxycyclini hyclas, *see* [Doxycycline hyclate](#)
- Doxycyclinum hemiaethanolicum hemihydricum, *see* [Doxycycline hyclate](#)
- Doxylamine hydrogen succinate, [465](#)
- Doxylamini hydrogenosuccinas, *see* [Doxylamine hydrogen succinate](#)
- Doxylaminum succinicum, *see* [Doxylamine hydrogen succinate](#)
- Drofenine hydrochloride, [469](#)
- Drofenini hydrochloridum, *see* [Drofenine hydrochloride](#)
- Drofeninum hydrochloricum, *see* [Drofenine hydrochloride](#)
- Econazole nitrate, [473](#)
- Econazoli nitras, *see* [Econazole nitrate](#)
- Econazolum nitricum, *see* [Econazole nitrate](#)
- Emulgade® 1000 NI, *see* [Cetostearyl alcohol](#)
- Emulsifying cetostearyl alcohol (type A), *see* [Cetostearyl alcohol](#)
- Eosin yellowish, [477](#)
- Eosinum natricum, *see* [Eosin yellowish](#)
- Ephedrine hydrochloride, [481](#)
- Ephedrini hydrochloridum, *see* [Ephedrine hydrochloride](#)
- Ephedrinum hydrochloricum, *see* [Ephedrine hydrochloride](#)
- Epinephrine hydrogen tartrate, [485](#)

- Ergotamine tartrate, 489
- Ergotamini tartras, *see* [Ergotamine tartrate](#)
- Ergotaminum tartricum, *see* [Ergotamine tartrate](#)
- Erythromycin, 493
- Erythromycinum, *see* [Erythromycin](#)
- Estradiol benzoate, 505
- Estradiol hemihydrate, 511
- Estradiol valerate, 517
- Estradioli benzoas, *see* [Estradiol benzoate](#)
- Estradioli valeras, *see* [Estradiol valerate](#)
- Estradiolum hemihydricum, *see* [Estradiol hemihydrate](#)
- Estriol, 523
- Estriolum, *see* [Estriol](#)
- Ethacridine lactate monohydrate, 529
- Ethacridini lactas monohydricus, *see* [Ethacridine lactate monohydrate](#)
- Ethinyl estradiol, 533
- Ethinylestradiolum, *see* [Ethinyl estradiol](#)
- Ethyl hydrogen fumarate, 537
- Ethyl hydrogen fumarate calcium, 541
- Ethyl hydrogen fumarate magnesium, 545
- Ethylis Hydrogenofumaras, *see* [Ethyl hydrogen fumarate](#)
- Fampridine, 549
- Fampridinum, *see* [Fampridine](#)
- Finasteride (form III), 553
- Finasteridum (Form III), *see* [Finasteride \(form III\)](#)
- Fluconazole, 557
- Fluconazolum, *see* [Fluconazole](#)
- Fluocinolonacetamid, micronized, 561
- Fluocinoloni acetamidum micron., *see* [Fluocinolonacetamid, micronized](#)
- Fluocinolonum acetamidum micron., *see* [Fluocinolonacetamid, micronized](#)
- Folic acid, 565
- Fructose, 569
- Fructosum, *see* [Fructose](#)
- Furosemide, 575
- Furosemidum, *see* [Furosemide](#)
- Fusidic acid, 579
- Galactosum, *see* [D-galactose](#)
- Gelatina alba, *see* [Gelatin, white](#)
- Gelatine, white, 583
- Gentamicin sulfate, 587
- Gentamicin sulphate, *see* [Gentamicin sulfate](#)
- Gentamicini sulfas, *see* [Gentamicin sulfate](#)
- Gentamycinum sulfuricum, *see* [Gentamicin sulfate](#)
- Glucose monohydrate, 595
- Glucose, anhydrous, 603
- Glucosum anhydricum, *see* [Glucose, anhydrous](#)
- Glucosum monohydricum, *see* [Glucose monohydrate](#)
- Glutamic acid, 609
- Glycerinum monostearinum 40-55%, *see* [Monostereates](#)
- Glycerinum monostearinum 60, *see* [Monostereates](#)
- Glycerinum monostearinum emulsificantes, *see* [Monostereates](#)
- Glycerol monostearate 40-55%, *see* [Monostereates](#)
- Glycerol monostearate 60, *see* [Monostereates](#)
- Glycerol monostearate, self-emulsifying, *see* [Monostereates](#)
- Glyceroli monostearates 40-55%, *see* [Monostereates](#)
- Glyceroli monostearates 60, *see* [Monostereates](#)
- Glyceroli monostearates emulsificantes, *see* [Monostereates](#)
- Glycine, 613
- Glycinum, *see* [Glycine](#)
- Gramicidin, 617
- Gramicidinum, *see* [Gramicidin](#)
- Griseofulvin, 621
- Griseofulvinum, *see* [Griseofulvin](#)
- Guaifenesin, 625
- Guaifenesinum, *see* [Guaifenesin](#)
- Guaiaecium glycerinum, *see* [Guaifenesin](#)
- Gummi arabicum dispersione desiccata, *see* [Spray-dried arabic gum](#)
- Hard fat (601), 629
- Hard fat in pastilles, *see* [Waxes / Fats](#)
- Hard fat W35, *see* [Waxes / Fats](#)
- Heparin sodium, 633
- Heparinum natricum, *see* [Heparin sodium](#)
- Histamine dihydrochloride, 637
- Histamini dihydrochloridum, *see* [Histamine dihydrochloride](#)
- Histaminum hydrochloricum, *see* [Histamine dihydrochloride](#)
- Hyaluronic acid sodium salt, 641
- Hydrochinonum, *see* [Hydroquinone](#)
- Hydrochlorothiazide, 645
- Hydrochlorothiazidum, *see* [Hydrochlorothiazide](#)
- Hydrocortisone, 649
- Hydrocortisone acetate, 659
- Hydrocortisone butyrate, 667
- Hydrocortisoni acetate, *see* [Hydrocortisone acetate](#)
- Hydrocortisoni butyras micronisatum, *see* [Hydrocortisone butyrate](#)
- Hydrocortisonum aceticum, *see* [Hydrocortisone acetate](#)
- Hydrocortisonum purum, *see* [Hydrocortisone](#)

- Hydroquinone, [671](#)
- Hydroxychinoliniumsulfuricum, *see* [Quinoline sulfates](#)
- Hydroxyethyl cellulose (300 mPa · s), *see* [Hydroxyethylcelluloses \(300 / 9000 mPa · s\)](#)
- Hydroxyethyl cellulose (9000 mPa · s), *see* [Hydroxyethylcelluloses \(300 / 9000 mPa · s\)](#)
- Hydroxyethylcelluloses (300 / 9000 mPa · s), [675](#)
- Hydroxyethylcellulosum G 300, *see* [Hydroxyethylcelluloses \(300 / 9000 mPa · s\)](#)
- Hydroxyethylcellulosum H 300, *see* [Hydroxyethylcelluloses \(300 / 9000 mPa · s\)](#)
- Hydroxyethylcellulosum HX, *see* [Hydroxyethylcelluloses \(300 / 9000 mPa · s\)](#)
- Hydroxypropyl cellulose (300 mPa · s), [683](#)
- Hydroxypropylcellulosum (300 mPa · s), *see* [Hydroxypropyl cellulose \(300 mPa · s\)](#)
- Hyoscine butylbromide, [687](#)
- Hyoscine hydrobromide, [691](#)
- Hyoscini butylbromidum, *see* [Hyoscine butylbromide](#)
- Hypromellose 4000, *see* [Methyl cellulose](#)
- Hypromellosum E4M Prem, *see* [Methyl cellulose](#)
- Ibuprofen, [695](#)
- Ibuprofenum, *see* [Ibuprofen](#)
- Indigo carmine I, [699](#)
- Indometacinum, *see* [Indomethacin](#)
- Indomethacin, [703](#)
- Inositol, [707](#)
- Inositolum, *see* [Inositol](#)
- Iodoform, [711](#)
- Iodoformium, *see* [Iodoform](#)
- Ipratropii bromidum, *see* [Ipratropium bromide](#)
- Ipratropium bromatum, *see* [Ipratropium bromide](#)
- Ipratropium bromide, [715](#)
- Isorbidi dinitras 40%, *see* [Isosorbide dinitrate 40%](#)
- Isosobidum dinatricum 40%, *see* [Isosorbide dinitrate 40%](#)
- Isosorbide dinitrate 40%, [719](#)
- Isosuprini hydrochloridum, *see* [Isoxuprine hydrochloride](#)
- Isoxuprine hydrochloride, [725](#)
- Jodochloroxychinolinum, *see* [Clioquinol](#)
- Jodoformium, *see* [Iodoform](#)
- Kalii bitartaricum, *see* [Potassium hydrogen tartrate](#)
- Kalii citras, *see* [Potassium citrate](#)
- Kalii citricum, *see* [Potassium citrate](#)
- Kalii hydrogentartras, *see* [Potassium hydrogen tartrate](#)
- Kalii natrii tartras tetrahydricus, *see* [Potassium sodium tartrate tetrahydrate](#)
- Kalii orotas, *see* [Potassium orotate](#)
- Kalii oroticum, *see* [Potassium orotate](#)
- Kalii oxychinolinum sulfuricum, *see* [Quinoline sulfates](#)
- Kalii sorbas, *see* [Potassium sorbate](#)
- Kalii sorbinicum, *see* [Potassium sorbate](#)
- Kalii sulfuajacolicum, *see* [Sulfogaiacol hydrate](#)
- Kalii tartaricum, *see* [Potassium tartrate hemihydrate](#)
- Kalii tartras hemihydricus, *see* [Potassium tartrate hemihydrate](#)
- Ketamine hydrochloride, [729](#)
- Ketamini hydrochloridum, *see* [Ketamine hydrochloride](#)
- Ketaminum hydrochloricum, *see* [Ketamine hydrochloride](#)
- Ketoconazole, [733](#)
- Ketoconazolum, *see* [Ketoconazole](#)
- Ketoprofen, [737](#)
- Ketoprofenum, *see* [Ketoprofen](#)
- L-citrulline, *see* [Citrulline](#)
- L-glutathione, [757](#)
- L-Glutathionum, *see* [L-glutathione](#)
- L-isoleucine, [775](#)
- L-Isoleucinum, *see* [L-isoleucine](#)
- L-leucine, [783](#)
- L-malic acid, [787](#)
- L-phenylalanine, [791](#)
- L-proline, [795](#)
- L-serine, [799](#)
- L-threonine, [803](#)
- L-tryptophan, [807](#)
- Lactose monohydrate, [741](#)
- Lactosum monohydricum, *see* [Lactose monohydrate](#)
- Laevulosum, *see* [Fructose](#)
- Lecithinum e sojæ plv., *see* [Soy lecithin \(instant form\)](#)
- Leucinum, *see* [L-leucine](#)
- Levocarnitine, [749](#)
- Levocarnitivum, *see* [Levocarnitine](#)
- Levomentholum, *see* [Menthol](#)
- Levothyroxine sodium, [753](#)
- Levothyroxinum natrii, *see* [Levothyroxine sodium](#)
- Lidocaine, [761](#)

Lidocaine hydrochloride, 767
 Lidocaini hydrochloridum, *see* [Lidocaine hydrochloride](#)
 Lidocainum, *see* [Lidocaine](#)
 Lidocainum hydrochloricum, *see* [Lidocaine hydrochloride](#)
 Lithii orotas monohydricum, *see* [Lithium orotate monohydrate](#)
 Lithium orotate monohydrate, 779
 Lysine HCl, *see* [Lysine hydrochloride](#)
 Lysine hydrochloride, 811
 Lysini hydrochloridum, *see* [Lysine hydrochloride](#)
 Lysini hydrochloridum Inf, *see* [Lysine hydrochloride](#)

 Macrogol 1500, 815
 Macrogol 4000, *see* [Macrogol 4000/6000](#)
 Macrogol 4000/6000, 819
 Macrogol 6000 powder, fine, *see* [Macrogol 4000/6000](#)
 Macrogolum 1500, *see* [Macrogol 1500](#)
 Macrogolum 4000, *see* [Macrogol 4000/6000](#)
 Macrogolum 6000 plv., *see* [Macrogol 4000/6000](#)
 Magnesii aspartas dihydricus, *see* [Magnesium aspartate dihydrate](#)
 Magnesii aspartas tetrahydricus, *see* [Magnesium hydrogen aspartate tetrahydrate](#)
 Magnesii asparticum tetrahydricum, *see* [Magnesium hydrogen aspartate tetrahydrate](#)
 Magnesii citras anhydricus, *see* [Magnesium citrate, anhydrous](#)
 Magnesii citricum siccatum, *see* [Magnesium citrate, anhydrous](#)
 Magnesii ethylhydrogenofumaras, *see* [Ethyl hydrogen fumarate magnesium](#)
 Magnesii hydrogenocitras hydricus, *see* [Magnesium \(hydrogen\) citrate](#)
 Magnesii hydrogenocitricum, *see* [Magnesium \(hydrogen\) citrate](#)
 Magnesii orotas, *see* [Magnesium orotate dihydrate](#)
 Magnesii oroticum, *see* [Magnesium orotate dihydrate](#)
 Magnesii stearas, *see* [Magnesium stearate](#)
 Magnesii stearinicum, *see* [Magnesium stearate](#)
 Magnesium (hydrogen) citrate, 827
 Magnesium aspartate dihydrate, 835
 Magnesium citrate, anhydrous, 839
 Magnesium hydrogen aspartate tetrahydrate, 843
 Magnesium orotate dihydrate, 847
 Magnesium stearate, 851

 Maltodextrin, 855
 Maltodextrinum, *see* [Maltodextrin](#)
 Manganese orotate dihydrate, 859
 Mannitole, 863
 Mannitolium, *see* [Mannitole](#)
 Maydis amyllum, *see* [Starch](#)
 Melatonin, 871
 Melatoninum, *see* [Melatonin](#)
 Menthol, 877
 Mentholum, *see* [Menthol](#)
 Mepivacaine hydrochloride, 885
 Mepivacaini hydrochloridum, *see* [Mepivacaine hydrochloride](#)
 Mepivacainum hydrochloricum, *see* [Mepivacaine hydrochloride](#)
 Mesalazine, 889
 Mesalazinum, *see* [Mesalazine](#)
 Metamizol sodium monohydrate, 893
 Metamizolum natricum monohydricum, *see* [Metamizol sodium monohydrate](#)
 Methacholine chloride, 897
 Methacholinii chloridum, *see* [Methacholine chloride](#)
 Methacholinium chloratum, *see* [Methacholine chloride](#)
 Methionine, 901
 Methioninum, *see* [Methionine](#)
 Methoxsalen, 905
 Methoxsalenum, *see* [Methoxsalen](#)
 Methyl cellulose, 909
 Methyl-4-hydroxybenzoate, 915
 Methylcellulosum, *see* [Methyl cellulose](#)
 Methylcobalamin, 921
 Methylhydroxypropylcellulosum E4M Prem, *see* [Methyl cellulose](#)
 Methylis parahydroxybenzoas, *see* [Methyl-4-hydroxybenzoate](#)
 Methylis parahydroxybenzoas natricus, *see* [Sodium methyl-4-hydroxybenzoate](#)
 Methylum parahydroxybenzoicum, *see* [Methyl-4-hydroxybenzoate](#)
 Methylprednisolone, 925
 Methylprednisolonum, *see* [Methylprednisolone](#)
 Methylrosanilini chloridum, *see* [Methylrosanilinium chloride](#)
 Methylrosanilinium chloratum, *see* [Methylrosanilinium chloride](#)
 Methylrosanilinium chloride, 929
 Metoclopramide hydrochloride, 933
 Metoclopramidi hydrochloridum, *see* [Metoclopramide hydrochloride](#)
 Metoprolol tartrate, 937
 Metoprololi tartras, *see* [Metoprolol tartrate](#)
 Metronidazole, 941
 Metronidazolum, *see* [Metronidazole](#)
 Miconazole nitrate, 951

Miconazoli nitras, *see* [Miconazole nitrate](#)
 Miconazolum nitricum, *see* [Miconazole nitrate](#)
 Minoxidil, [959](#)
 Minoxidilum, *see* [Minoxidil](#)
 Mometasone furoate, micronized, [967](#)
 Mometasoni furoas micronisatum, *see*
 [Mometasone furoate, micronized](#)
 Mometasonum furanicum micronisatum, *see*
 [Mometasone furoate, micronized](#)
 Monostereates, [975](#)
 Mupirocin calcium, [981](#)
 Mupirocinum calcii, *see* [Mupirocin calcium](#)
 myo-Inositolum, *see* [Inositol](#)

Naloxone hydrochloride dihydrate, [985](#)
 Naloxoni hydrochloridum dihydricum, *see*
 [Naloxone hydrochloride dihydrate](#)
 Naphazoline hydrochloride, [989](#)
 Naphazoline nitrate, [993](#)
 Naphazolini hydrochloridum, *see* [Naphazoline hydrochloride](#)
 Naphazolini nitras, *see* [Naphazoline nitrate](#)
 Naphazolinum hydrochloricum, *see*
 [Naphazoline hydrochloride](#)
 Naphazolinum nitricum, *see* [Naphazoline nitrate](#)
 Naproxen, [997](#)
 Naproxenum, *see* [Naproxen](#)
 Natrii acetat trihydricum, *see* [Sodium acetate trihydrate](#)
 Natrii aceticum, *see* [Sodium acetate trihydrate](#)
 Natrii aethylendiaminum tetraaceticum, *see*
 [Sodium edetate](#)
 Natrii alginas, *see* [Sodium alginate](#)
 Natrii alginicum, *see* [Sodium alginate](#)
 Natrii ascorbas, *see* [Sodium ascorbate](#)
 Natrii ascorbinicum, *see* [Sodium ascorbate](#)
 Natrii benzoas, *see* [Sodium benzoate](#)
 Natrii benzoicum, *see* [Sodium benzoate](#)
 Natrii carboxymethylcellulosi
 (400/450/500/600/1600 mPa · s), *see*
 [Carmellose sodium](#)
 (400/450/500/600/1600 mPa · s)
 Natrii citras, *see* [Sodium citrate](#)
 Natrii citricum, *see* [Sodium citrate](#)
 Natrii cromoglicas, *see* [Sodium cromoglicate](#)
 Natrii cromoglicinicum, *see* [Sodium cromoglicate](#)
 Natrii cyclamas, *see* [Sodium cyclamate](#)
 Natrii cyclamicum, *see* [Sodium cyclamate](#)
 Natrii diclofenaci, *see* [Diclofenac sodium](#)
 Natrii heparini, *see* [Heparin sodium](#)
 Natrii Hyaluronas, *see* [Hyaluronic acid sodium salt](#)
 Natrii lactoflavini phosphoricum, *see*
 [Riboflavin phosphate sodium](#)

Natrii laurylsulfuricum, *see* [Waxes / Fats](#)
 Natrii molybdaenicum dihydricum, *see*
 [Sodium molybdate dihydrate](#)
 Natrii molybdas dihydricus, *see* [Sodium molybdate dihydrate](#)
 Natrii salicylas plv., *see* [Sodium salicylate, powdered](#)
 Natrii salicylicum plv., *see* [Sodium salicylate, powdered](#)
 Natrii tetraboricum, *see* [Sodium tetraborate](#)
 Natrium methylparahydroxybenzoicum, *see*
 [Sodium methyl-4-hydroxybenzoate](#)
 Neomycin sulfate, [1001](#)
 Neomycin sulphate, *see* [Neomycin sulfate](#)
 Neomycini sulfas, *see* [Neomycin sulfate](#)
 Neomycinum sulfuricum, *see* [Neomycin sulfate](#)
 Neostigmine bromide, [1007](#)
 Neostigmini bromidum, *see* [Neostigmine bromide](#)
 Nicotinamide, [1011](#)
 Nicotinamidum, *see* [Nicotinamide](#)
 Nicotinic acid, [1015](#)
 Nicotinoylamidum, *see* [Nicotinamide](#)
 Nitrofurantoin, [1019](#)
 Nitrofurantoinum, *see* [Nitrofurantoin](#)
 Non-ionic emulsifying alcohol, [1023](#)
 Norethisterone acetate, [1027](#)
 Norethisteroni acetat, *see* [Norethisterone acetate](#)
 Norethisteronum aceticum, *see*
 [Norethisterone acetate](#)

Octenidine dihydrochloride, [1031](#)
 Octenidini dihydrochloridum, *see* [Octenidine dihydrochloride](#)
 Oestradiolum benzoicum, *see* [Estradiol benzoate](#)
 Oestradiolum hemihydricum, *see* [Estradiol hemihydrate](#)
 Oestradiolum valerianicum, *see* [Estradiol valerate](#)
 Oestriolum, *see* [Estriol](#)
 Ofloxacin, [1035](#)
 Ofloxacinum, *see* [Ofloxacin](#)
 Oleum cacao, *see* [Waxes / Fats](#)
 Omeprazole, [1039](#)
 Omeprazolom, *see* [Omeprazole](#)
 Ornithine aspartate, [1043](#)
 Ornithine hydrochloride, [1047](#)
 Ornithini aspartas, *see* [Ornithine aspartate](#)
 Ornithini hydrochloridum, *see* [Ornithine hydrochloride](#)
 Ornithinum asparticum, *see* [Ornithine aspartate](#)
 Ornithinum hydrochloricum, *see* [Ornithine hydrochloride](#)

- Oryzae amyllum, *see* [Starch](#)
 Oxalic acid, [1051](#)
 Oxybuprocaine hydrochloride, [1055](#)
 Oxybuprocaini hydrochloridum, *see* [Oxybuprocaine hydrochloride](#)
 Oxybuprocainum hydrochloricum, *see* [Oxybuprocaine hydrochloride](#)
 Oxybutynin hydrochloride, [1059](#)
 Oxybutynini hydrochloridum, *see* [Oxybutynin hydrochloride](#)
 Oxybutyninum hydrochloricum, *see* [Oxybutynin hydrochloride](#)
 Oxytetracycline hydrochloride, [1063](#)
 Oxytetracyclini hydrochloridum, *see* [Oxytetracycline hydrochloride](#)
 Oxytetracyclinum hydrochloricum, *see* [Oxytetracycline hydrochloride](#)

 Pancreas powder, [1069](#)
 Pancreatinum, *see* [Pancreas powder](#)
 Pancreatis pulvis, *see* [Pancreas powder](#)
 Papaverine hydrochloride, [1073](#)
 Papaverini hydrochloridum, *see* [Papaverine hydrochloride](#)
 Papaverinum hydrochloricum, *see* [Papaverine hydrochloride](#)
 Paracetamol, [1077](#)
 Paracetamolum, *see* [Paracetamol](#)
 Paraffin, hard, *see* [Waxes / Fats](#)
 Paraffin, microcrystalline, *see* [Waxes / Fats](#)
 Paraffinum durum in rotulis, *see* [Waxes / Fats](#)
 Paraffinum microcristallinum, *see* [Waxes / Fats](#)
 Paraffinum solidum in rotulis, *see* [Waxes / Fats](#)
 Patent blue V, E131, [1081](#)
 Phenazone, [1085](#)
 Phenazonum, *see* [Phenazone](#)
 Pheniramine maleate, [1089](#)
 Pheniramini maleas, *see* [Pheniramine maleate](#)
 Pheniraminum maleinicum, *see* [Pheniramine maleate](#)
 Phenylalaninum, *see* [L-phenylalanine](#)
 Phenylbutazon, [1093](#)
 Phenylbutazonum, *see* [Phenylbutazon](#)
 Phenylldimethylpyrazolonum, *see* [Phenazone](#)
 Phenylephrine hydrochloride, [1097](#)
 Phenylephrini hydrochloridum, *see* [Phenylephrine hydrochloride](#)
 Phenylephrinum hydrochloricum, *see* [Phenylephrine hydrochloride](#)
 Phenytoin, [1101](#)
 Phenytoinum, *see* [Phenytoin](#)
 Pilocarpine hydrochloride, [1105](#)
 Pilocarpini hydrochloridum, *see* [Pilocarpine hydrochloride](#)
 Pilocarpinum hydrochloricum, *see* [Pilocarpine hydrochloride](#)
 Poloxamer 407, [1109](#)
 Polyethylenglycolum 1500, *see* [Macrogol 1500](#)
 Polyethylenglycolum 4000, *see* [Macrogol 4000/6000](#)
 Polyethylenglycolum 6000 plv., *see* [Macrogol 4000/6000](#)
 Polymixinum-B-sulfuricum, *see* [Polymyxin B sulfate](#)
 Polymyxin B sulfate, [1113](#)
 Polymyxin B sulphate, *see* [Polymyxin B sulfate](#)
 Polymyxini B sulfas, *see* [Polymyxin B sulfate](#)
 Polyvinylpyrrolidoni jodium, *see* [Povidone iodine](#)
 Potassium citrate, [1117](#)
 Potassium hydrogen tartrate, [1123](#)
 Potassium orotate, [1127](#)
 Potassium sodium tartrate tetrahydrate, [1131](#)
 Potassium sorbate, [1135](#)
 Potassium tartrate hemihydrate, [1141](#)
 Potato starch, *see* [Starch](#)
 Povidone 25, soluble, [1145](#)
 Povidone iodine, [1149](#)
 Povidonum 25, solubile, *see* [Povidone 25, soluble](#)
 Povidonum iodinatum, *see* [Povidone iodine](#)
 Prasterone, [1153](#)
 Prasteronum, *see* [Prasterone](#)
 Prednicarbate, micronized, [1157](#)
 Prednicarbatum micronisatum, *see* [Prednicarbate, micronized](#)
 Prednisolinum aceticum, *see* [Prednisolone acetate](#)
 Prednisolon dihydrogen phosphate dinatrium, [1163](#)
 Prednisolone acetate, [1167](#)
 Prednisolone hydrogen succinate, [1175](#)
 Prednisolone, micronized, [1179](#)
 Prednisoloni acetat, *see* [Prednisolone acetate](#)
 Prednisoloni hydrogenosuccinas, *see* [Prednisolone hydrogen succinate](#)
 Prednisoloni natrii phosphas, *see* [Prednisolon dihydrogen phosphate dinatrium](#)
 Prednisolonum micronisatum, *see* [Prednisolone, micronized](#)
 Prednisolonum natrii phosphoricum, *see* [Prednisolon dihydrogen phosphate dinatrium](#)
 Prednisone, [1187](#)
 Prednisonum, *see* [Prednisone](#)
 Pregnenolone, [1191](#)
 Pregnenolonum, *see* [Pregnenolone](#)
 Prilocaine hydrochloride, [1195](#)
 Prilocaini hydrochloridum, *see* [Prilocaine](#)

- hydrochloride
- Prilocainum hydrochloricum, *see* [Prilocaine hydrochloride](#)
- Procaine hydrochloride, [1199](#)
- Procaini hydrochloridum, *see* [Procaine hydrochloride](#)
- Procaïnium hydrochloricum, *see* [Procaine hydrochloride](#)
- Progesterone, micronized, [1203](#)
- Progesteronum micronisatum, *see* [Progesterone, micronized](#)
- Prolinum, *see* [L-proline](#)
- Promethazine hydrochloride, [1211](#)
- Promethazini hydrochloridum, *see* [Promethazine hydrochloride](#)
- Promethazinum hydrochloricum, *see* [Promethazine hydrochloride](#)
- Propranolol hydrochloride, [1215](#)
- Propranololi hydrochloridum, *see* [Propranolol hydrochloride](#)
- Propranololum hydrochloricum, *see* [Propranolol hydrochloride](#)
- Propyl-4-hydroxybenzoate, [1221](#)
- Propylis parahydroxybenzoas, *see* [Propyl-4-hydroxybenzoate](#)
- Propylum parahydroxybenzoicum, *see* [Propyl-4-hydroxybenzoate](#)
- Propyphenazone, [1225](#)
- Propyphenazonum, *see* [Propyphenazone](#)
- Propyphenazonum plv., *see* [Propyphenazone](#)
- Pyridoxal-5-phosphate, [1229](#)
- Pyridoxali phosphas, *see* [Pyridoxal-5-phosphate](#)
- Pyridoxine hydrochloride, [1233](#)
- Pyridoxini hydrochloridum, *see* [Pyridoxine hydrochloride](#)
- Pyridoxini hydrochloridum, *see* [Pyridoxine hydrochloride](#)
- Quinidine sulfate dihydrate, [1237](#)
- Quinidine sulphate dihydrate, *see* [Quinidine sulfate dihydrate](#)
- Quinine hydrochloride, [1241](#)
- Quinine sulfate dihydrate, [1245](#)
- Quinine sulphate dihydrate, *see* [Quinine sulfate dihydrate](#)
- Quinoline sulfates, [1249](#)
- Quinoline yellow, [1253](#)
- Quinolinol sulfate potassium sulfate, *see* [Quinoline sulfates](#)
- Quinolinol sulphate potassium sulphate, *see* [Quinoline sulfates](#)
- Resocriinol, [1257](#)
- Resorcinolum, *see* [Resocriinol](#)
- Ribavirin, [1261](#)
- Ribavirinum, *see* [Ribavirin](#)
- Riboflavin, [1265](#)
- Riboflavin phosphate sodium, [1269](#)
- Riboflavini natrii phosphas, *see* [Riboflavin phosphate sodium](#)
- Riboflavinum, *see* [Riboflavin](#)
- Rice starch, *see* [Starch](#)
- Rutinum, *see* [Rutoside trihydrate](#)
- Rutoside trihydrate, [1273](#)
- Rutosidum trihydricum, *see* [Rutoside trihydrate](#)
- Saccharin sodium, [1277](#)
- Saccharinum natricum, *see* [Saccharin sodium](#)
- Saccharinum solubile, *see* [Saccharin sodium](#)
- Saccharum, *see* [Sucrose](#)
- Saccharum amylaceum, *see* [Glucose monohydrate](#)
- Saccharum amylaceum anhydricum, *see* [Glucose, anhydrous](#)
- Saccharum lactis, *see* [Lactose monohydrate](#)
- Salbutamol sulfate, [1281](#)
- Salbutamol sulphate, *see* [Salbutamol sulfate](#)
- Salbutamoli sulfas, *see* [Salbutamol sulfate](#)
- Salbutamololum sulfuricum, *see* [Salbutamol sulfate](#)
- Salicylic acid, [1285](#)
- Scopolamini hydrobromidum, *see* [Hyoscine hydrobromide](#)
- Selenium yeast, [1295](#)
- Serinum, *see* [L-serine](#)
- Sildenafil citrate, [1299](#)
- Sildenafil citras, *see* [Sildenafil citrate](#)
- Sodium acetate trihydrate, [1303](#)
- Sodium alginate, [1307](#)
- Sodium ascorbate, [1311](#)
- Sodium benzoate, [1315](#)
- Sodium citrate, [1321](#)
- Sodium cromoglicate, [1329](#)
- Sodium cyclamate, [1333](#)
- Sodium dodecyl sulfate, *see* [Waxes / Fats](#)
- Sodium dodecyl sulphate, *see* [Waxes / Fats](#)
- Sodium edetate, [1337](#)
- Sodium methyl-4-hydroxybenzoate, [1343](#)
- Sodium molybdate dihydrate, [1347](#)
- Sodium saccharin, *see* [Saccharin sodium](#)
- Sodium salicylate, powdered, [1351](#)
- Sodium tetraborate, [1355](#)
- Solani amyllum, *see* [Starch](#)
- Sorbic acid, [1359](#)
- Sorbitan stearate, *see* [Monostereates](#)
- Sorbitani stearas, *see* [Monostereates](#)
- Sorbitanum monostearinicum, *see* [Monostereates](#)
- Sorbitol, [1363](#)
- Sorbitolum, *see* [Sorbitol](#)
- Soy lecithin (instant form), [1369](#)
- Spironolactone, [1373](#)
- Spironolactonum, *see* [Spironolactone](#)

Thiamini hydrochloridum, *see* [Thiamine chloride hydrochloride](#)
Threoninum, *see* [L-threonine](#)
Thymol, [1477](#)
Thymolum, *see* [Thymol](#)
Tobramycin sulfate, [1481](#)
Tobramycin sulphate, *see* [Tobramycin sulfate](#)
Tobramycini sulfas, *see* [Tobramycin sulfate](#)
Tobramycinum sulfuricum, *see* [Tobramycin sulfate](#)
Tosylchloramide sodium, [1485](#)
Tosylchloramidum natricum, *see* [Tosylchloramide sodium](#)
Tranexamic acid, [1489](#)
Tretinoin, [1493](#)
Tretinoinum, *see* [Tretinoin](#)
Triamcinolon, micronized, [1499](#)
Triamcinolone acetone, [1503](#)
Triamcinoloni acetone, *see* [Triamcinolone acetone](#)
Triamcinolonum acetone, *see* [Triamcinolone acetone](#)
Triamcinolonum micronisatum, *see* [Triamcinolon, micronized](#)
Triclosan, [1515](#)
Triclosanum, *see* [Triclosan](#)
Tritici amyllum, *see* [Starch](#)
Trometamol, [1527](#)
Trometamolum, *see* [Trometamol](#)
Tropicamide, [1533](#)
Tropicamidum, *see* [Tropicamide](#)
Tryptophanum, *see* [L-tryptophan](#)
Tyrosine, [1537](#)
Tyrosinum, *see* [Tyrosine](#)
Tyrothricin, [1541](#)
Tyrothricinum, *see* [Tyrothricin](#)

Ubidecarenone, [1545](#)
Ubidecarenonum, *see* [Ubidecarenone](#)
Urea, [1549](#)
Urea pura, *see* [Urea](#)
Ureum, *see* [Urea](#)
Uridine, [1559](#)
Uridinum, *see* [Uridine](#)

Valine, [1563](#)
Valinum, *see* [Valine](#)
Vancomycin hydrochloride, [1567](#)
Vancomycini hydrochloridum, *see* [Vancomycin hydrochloride](#)
Vanillin, [1571](#)
Vanillinum, *see* [Vanillin](#)

Wax, bleached, *see* [Waxes / Fats](#)
Wax, yellow, *see* [Waxes / Fats](#)
Waxes / Fats, [1575](#)
Wheat starch, *see* [Starch](#)
Wool alcohols, [1589](#)

Xylitol, [1593](#)

Xylitolum, *see* [Xylitol](#)

Xylometazoline hydrochloride, [1597](#)

Xylometazolini hydrochloridum, *see*
[Xylometazoline hydrochloride](#)

Xylometazolinum hydrochloricum, *see*
[Xylometazoline hydrochloride](#)

Xylose, [1601](#)

Xylosum, *see* [Xylose](#)

Zinc acetate dihydrate, [1605](#)

Zinc gluconate, [1609](#)

Zinci acetas dihydricus, *see* [Zinc acetate dihydrate](#)

Zinci gluconas, *see* [Zinc gluconate](#)

Zincum aceticum purum, *see* [Zinc acetate dihydrate](#)

Zincum gluconicum, *see* [Zinc gluconate](#)