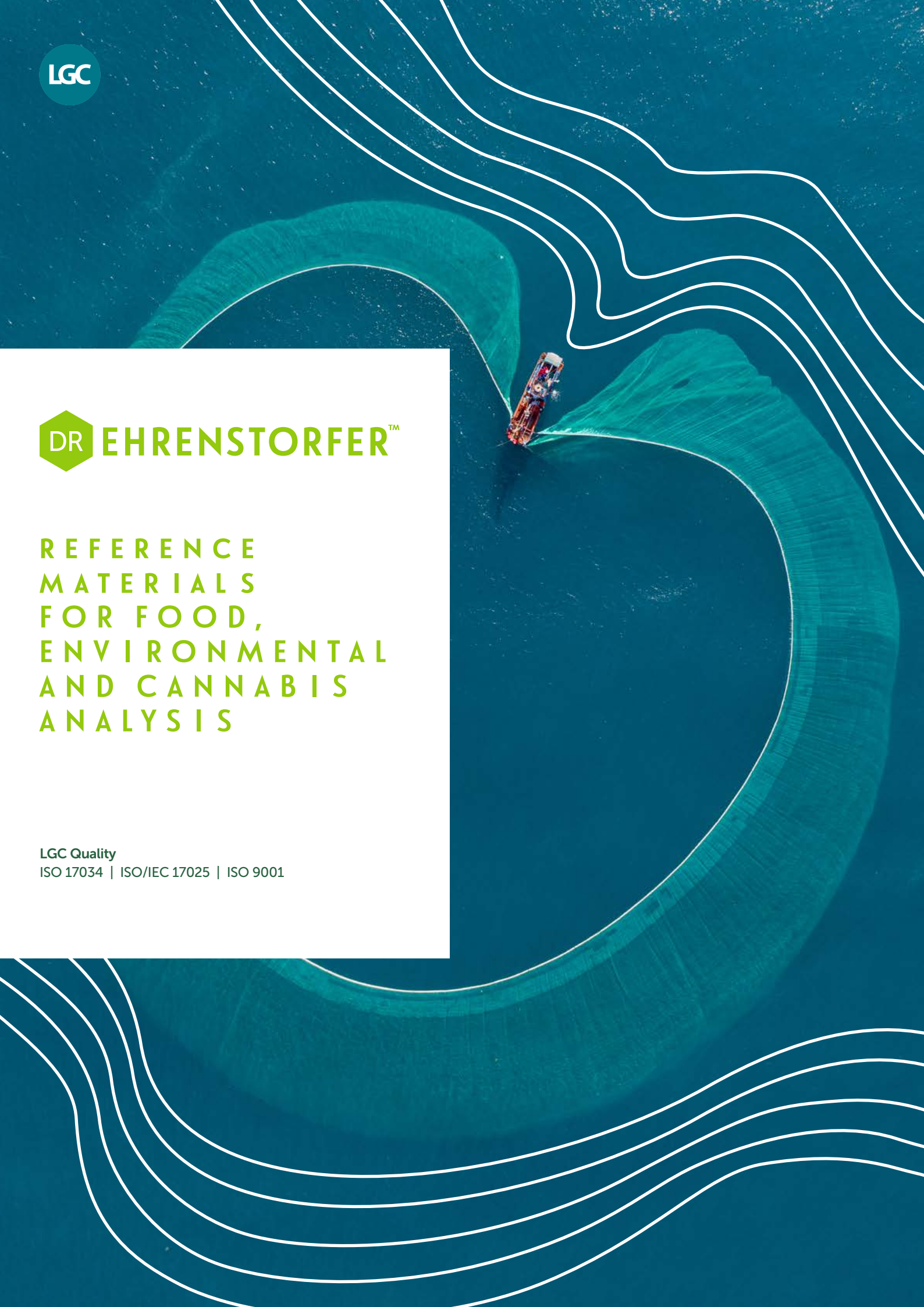


DR EHRENSTORFER™

REFERENCE MATERIALS FOR FOOD, ENVIRONMENTAL AND CANNABIS ANALYSIS

LGC Quality
ISO 17034 | ISO/IEC 17025 | ISO 9001

DR EHRENSTORFER™

Since 1975, Dr. Ehrenstorfer™ has led the way in producing pesticide reference standards. Today, our portfolio has expanded to adapt to changing regulations and technology.

- Our groundbreaking iMix range – the largest range of analytes in one mix
- Our leading range of neat materials. Those that are manufactured under ISO 17034 are labelled in this catalogue with the symbol ‡
- New pesticide and metabolite reference materials
- Stable isotope labelled reference materials for analysis using mass spectrometry
- A wide range of veterinary and pharmaceutical residue reference materials, including marker metabolites
- Popular mixtures for EPA and other regulatory methods
- Our significant update to cannabis related reference materials to support potency, quality and contamination testing
- A chapter dedicated to our wide range of mycotoxin reference materials for your analytical testing

Nadine Müller, Chromatography Team Leader

EHRENSTORFER QUALITY

At Dr. Ehrenstorfer we place an emphasis on quality as part of our commitment to providing you with products you can trust. Here is what 'Ehrenstorfer Quality' means to us:

Producing to the highest standard

Dr. Ehrenstorfer reference materials are produced to the highest quality, with all analytical measurements performed under our ISO/IEC 17025 scope of accreditation and a leading portfolio of products produced according to our ISO 17034 accreditation. We use the most advanced analytical techniques to characterise our reference materials so that you can rely on the scientific integrity of the data contained in your Certificate of Analysis.

Ensuring confidence from characterisation to implementation

We use real-time stability testing and expiry date management to give you confidence in your Dr. Ehrenstorfer reference materials and ensure you receive your products as certified, ready for your analysis. Our careful packaging choices protect your product during delivery and storage, and are made with your convenience and safety in mind.

Offering a unique and extensive portfolio

We produce an unrivalled portfolio of reference materials for food and environmental analysis, including unique substances, stable isotope labelled compounds and metabolites. Dr. Ehrenstorfer continues to be a global leader in pesticides and our range also features pharmaceutical and veterinary compounds, food related compounds, dyes, food packaging contaminants and more. We offer multiple formats including neats, single and multicomponent solutions.

Understanding your analytical needs

Through direct interactions with our customers and our expertise in the latest scientific and regulatory developments, we are able to quickly adapt our portfolio of reference materials to address your needs. We are committed to providing you with trusted solutions, today and tomorrow.

Providing expert support

At Dr. Ehrenstorfer we combine experience with continuous training to ensure that the latest knowledge and skills are being applied to producing your reference materials. As part of the LGC family, we are proud to connect with our customers across a global network, with dedicated local teams able to support your reference materials decisions and the implementation of our products in your analytical testing.

Our heritage, our vision, your guarantee

Dr. Ehrenstorfer is built upon more than 40 years of history in planning, developing, producing, analysing, packaging and delivering high quality reference materials to our customers around the world with speed and reliability. We are passionate about our work which supports you in your **science for a safer world**.

YOUR INDUSTRY INSIGHTS

Combating the threat of Antibiotic Residues in food

Antimicrobial resistance caused by veterinary medicines poses risks to human health, but a new, breakthrough testing kit from Dr Ehrenstorfer can help laboratories detect antibiotic residues more quickly and efficiently.

Veterinary medicines are used as both a preventive and a cure for a variety of diseases in production animals. Food products sourced from treated animals, may contain residues of these medicines for example, in eggs, meat or milk A 2019 study by Sachi et al highlighted the use of antimicrobials in animals suggesting that levels of antibiotic use in animals is more than double that of humans. The Food Standards Agency (FSA) has developed guidance for milk producers to ensure acceptable standards of hygiene are maintained and that the legal requirements for antibiotic residues are clear. This guidance does not consider instances of contamination through fraud or error therefore testing of food products before they enter the food chain is essential.

Build-up of these substances in the food chain can enable the development of antimicrobial resistance in bacteria which perpetuates the need for stronger and more potent antimicrobial drugs.

A 2018 report by European Food Safety Authority (EFSA) summarised veterinary residue monitoring data in live animals and animal products collected over a 10-year period. Many samples were collected but the majority originated from inside the EU where there are strict controls on the use of veterinary drugs in animals.

- The percentage of samples that exceeded the maximum levels was 0.3%
- Comparable to the previous 10 years (0.25%-0.37 %)
- A total of 657,818 samples were checked by 28 EU member states.

The report highlighted the need for closer monitoring of products imported into the EU with 0.4% of samples (3,022 sample size) identified as non-compliant and, of the total samples, 0.13% were found to contain unauthorised substances. Outside the EU however, drug products are not always used for therapeutic reasons – with their potential for use as growth promoters (hormones, beta-agonists, etc) particularly in countries where regulations or monitoring are not as strict as the EU. It has also been observed that some countries manage two food control systems, for products intended for domestic and international markets. This enables them to use veterinary medicines more freely in the domestic market. Therefore, screening of animal products entering the food chain can help to control the number of potentially harmful food products.

Veterinary drugs are one of the most chemically diverse group of compounds and metabolites, so it is technically challenging to develop a single multi-residue detection method to cover them. The number of sample preparation approaches is also diverse, with different sample extraction and purification procedures needed for each matrix of interest.

Most modern test methods are based upon LC-MS/MS, sometimes in conjunction with GC-MS/MS, to provide a high sensitivity and selectivity for a wide scope of chemical classes within a single multi-residue test method. The time and level of expertise needed to prepare a stable multi-residue reference material is the biggest challenge that laboratories encounter.

To ease the burden for laboratories, LGC Dr. Ehrenstorfer has developed PharmaVetResiMix to enable rapid screening of 59 analytes for liquid chromatography (LC) in just four ampoules.

These solutions can be combined in just three minutes to create a single solution providing a working standard for the day. Calibration, takes just 30 minutes, optimising a laboratory's efficiency and analytical performance.

You can extend the scope of Dr Ehrenstorfer's PharmaVetResiMix with two additional analyte groups, 10 Tetracyclines and 23 Beta lactams.

Designed for optimal elution and maximum stability, this product is the first of its kind. A mass screening and spiking method-validation product that doesn't sacrifice quality or reliability in providing you with a solution to increase efficiency and accuracy in your analytical processes.

Turn to page 450 to discover our range.

You can also learn more about pharmaceutical and veterinary residues in the food chain in the Dr. Ehrenstorfer podcast. experts Dr. Scott Haskell, Professor and Lead Instructor at Michigan State University and John Points, a UK based consultant who advises food manufacturers and regulators, discuss the global challenges posed by the use of pharmaceutical and veterinary medicines in both developing and first world countries. To download the podcast, visit **lgcstandards.com**

TECH TIPS FOR USING YOUR REFERENCE MATERIALS

With over 45 years of experience in reference materials, who better to support your testing? Here our experts answer your key questions, so you can get the most from the Dr Ehrenstrofer range.

1 What is the difference between ISO Guide 34 and ISO 17034 produced reference materials?

ISO 17034:2016 specifies general requirements for the competence and consistent operation of reference material producers. It also sets out the requirements in accordance with which reference materials are produced. It is intended to be used as part of the general quality assurance procedures of the reference material producer.

According to International Organization for Standardization, ISO 17034 replaces the ISO Guide 34 and in doing so, changes all recommendations of the Guide into requirements. Thus, there is no difference between how a product is indicated to be produced under ISO Guide 34 and ISO 17034. More relevant changes include inclusion of more detail on the required documentation in accordance with ISO Guides 31. All Dr. Ehrenstorfer products produced under ISO 17034 and their Certificates of Analysis comply completely to the requirements of the accreditation.

2 How do I tell which products were produced under ISO 17034?

As leaders in quality not only are our Dr. Ehrenstorfer production facilities accredited to ISO 17034, we actively produce the majority of our portfolio is under our ISO 17034 scope of accreditation. These materials are clearly identified in the certificate of analysis and in this catalogue by the symbol ‡. This range is constantly increasing, therefore if you are unable to find the product that you require, please contact your local sales office or email us at dr.ehrenstorfer@lgcgroup.com.

3 Can I still use products that are not produced under ISO 17034 for my analysis?

The appropriate reference materials for your analysis are determined by the specific method you are following. All Dr. Ehrenstorfer reference materials are designed, produced and verified in accordance with a registered quality management system ISO 9001 and all analytical measurements were performed under our ISO/IEC 17025 scope of accreditation - ensuring traceability. Our certificates of analyses are designed in accordance with ISO Guide 31, whether or not they were produced under our ISO 17034 scope of accreditation, providing the highest standard at all quality levels.

4 How much material is in the bottle/ampoule?

Dr. Ehrenstorfer reference materials are supplied with a nominal weight or volume and are typically overfilled with up to 10% more of the product than stated. In order to use the material for your analysis, it is usually practical to prepare a solution. The solution preparation procedure described below can be used to calculate the exact amount of material present.

5 The container looks empty – is there anything inside?

Don't worry - Yes, there is! Where small quantities of solid material are supplied, this can be dispersed over the inside surface of the container. Liquid may also coat the inner surface of the container which may not be visible. To best extract all material from container, it is best to transfer the contents with appropriate solvent and dry according to procedure below to calculate the exact amount of material present.

6 How can I extract all material from the bottle/ampoule and prepare a solution from a neat Dr. Ehrenstorfer product?

In order to recover all the material from the container the following procedure can be used. We recommend storing the vial / bottle in an upright position for at least 24 hours prior to handling.

1. Ensure the container is clean and dry. Using an analytical balance, weigh the container (including the lid for bottles) and record the weight.
2. Using a suitable solvent, carefully transfer the contents to a volumetric flask. Rinse the container (including the lid) at least three times and combine all rinses to ensure a complete transfer of material.
3. Dry the empty container completely, then using an analytical balance, weigh the dry, empty container and lid and record the weight.
4. Calculate the difference in weight between the first and second weighing. The difference in weight is the amount of material that has been transferred.
5. Make the solution up to volume in the volumetric flask. The concentration of the solution can then be determined. Where larger quantities of material are supplied, you may wish to only transfer an aliquot of the material. In these cases, you may need to use a weighing boat and a spatula to weigh the material before transferring it into the volumetric flask.

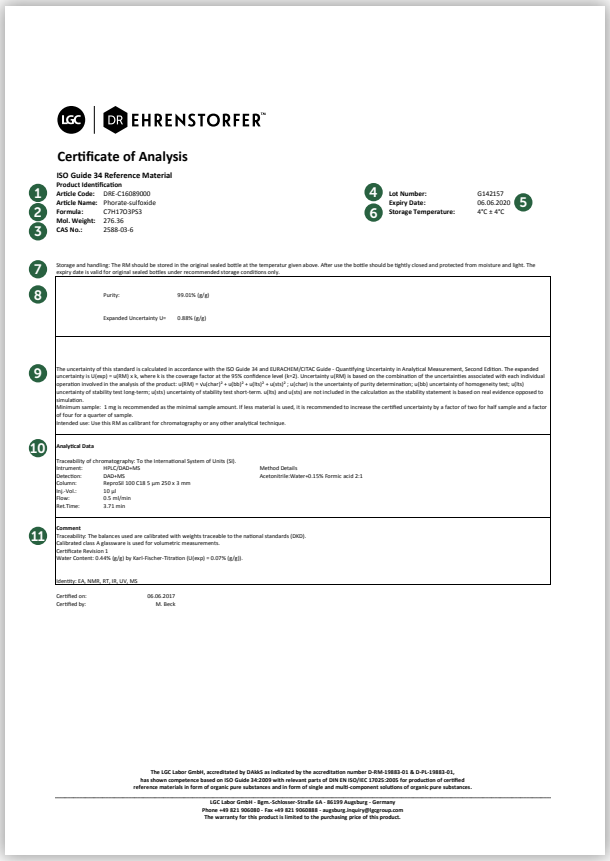
7 My Dr. Ehrenstorfer reference material was not shipped under the storage conditions found on the certificate of analysis. Is the product still ok to use?

The storage conditions on the certificate are for the long-term storage of the material. Normally products are not shipped under controlled conditions as shipping times are generally <72 hours and therefore short-term. One sample of each lot is kept aside to enable checks on the specific lot to be undertaken if required.

WHAT OUR CERTIFICATE OF ANALYSIS TELLS YOU

Every product you receive comes with a Dr. Ehrenstorfer Certificate of Analysis, which provides a full description of the material to which it relates, as well as a summary of the analyses undertaken during the characterisation process.

The following examples show Dr. Ehrenstorfer Reference Material Certificates of Analysis for neat products.



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Certificate of Analysis

ISO Guide 34 Reference Material

Product Identification

1 **Article Code:** DRE-C16089000
2 **Article Name:** Phorate-sulfoxide
Formula: C7H17O3PS3
Mol. Weight: 276.36
3 **CAS No.:** 2588-03-6

4 **Lot Number:** G142157
Expiry Date: 06.06.2020 5
6 **Storage Temperature:** 4°C ± 4°C

7 Storage and handling: The RM should be stored in the original sealed bottle at the temperatur given above. After use the bottle should be tightly closed and protected from moisture and light. The expiry date is valid for original sealed bottles under recommended storage conditions only.

8 Purity: 99.01% (g/g)

Expanded Uncertainty U= 0.88% (g/g)

9 The uncertainty of this standard is calculated in accordance with the ISO Guide 34 and EURACHEM/CITAC Guide - Quantifying Uncertainty in Analytical Measurement, Second Edition. The expanded uncertainty is U(exp) = u(RM) x k, where k is the coverage factor at the 95% confidence level (k=2). Uncertainty u(RM) is based on the combination of the uncertainties associated with each individual operation involved in the analysis of the product: $u(RM) = \sqrt{u(char)^2 + u(bb)^2 + u(lts)^2 + u(sts)^2}$; u(char) is the uncertainty of purity determination; u(bb) uncertainty of homogeneity test; u(lts) uncertainty of stability test long-term; u(sts) uncertainty of stability test short-term. u(lts) and u(sts) are not included in the calculation as the stability statement is based on real evidence opposed to simulation.
Minimum sample: 1 mg is recommended as the minimal sample amount. If less material is used, it is recommended to increase the certified uncertainty by a factor of two for half sample and a factor of four for a quarter of sample.
Intended use: Use this RM as calibrant for chromatography or any other analytical technique.

10 **Analytical Data**

Traceability of chromatography: To the International System of Units (SI).

Intrument:	HPLC/DAD+MS	Method Details
Detection:	DAD+MS	Acetonitrile:Water+0.15% Formic acid 2:1
Column:	Reprosil 100 C18 5 µm 250 x 3 mm	
Inj.-Vol.:	10 µl	
Flow:	0.5 ml/min	
Ret.Time:	3.71 min	

11 **Comment**
Traceability: The balances used are calibrated with weights traceable to the national standards (OIML).
Calibrated class A glassware is used for volumetric measurements.
Certificate Revision 1
Water Content: 0.44% (g/g) by Karl-Fischer-Titration (U(wcp) = 0.07% (g/g)).

Identity: EA, NMR, RT, IR, UV, MS

Certified on: 06.06.2017
Certified by: M. Beck

The LGC Labor GmbH, accreditated by DAkkS as indicated by the accreditation number D-RM-19883-01 & D-PL-19883-01, has shown competence based on ISO Guide 34:2009 with relevant parts of DIN EN ISO/IEC 17025:2005 for production of certified reference materials in form of organic pure substances and in form of single and multi-component solutions of organic pure substances.

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The warranty for this product is limited to the purchasing price of this product.

ISO Guide 34 Reference Material Certificate, 2014 – 2018

1 Product Name/Code
Unique identifiers for the product.

2 Mol. Weight/Formula
Molecular weight and formula stated directly on certificate for ease of reference.

3 CAS No.
Unique identifier for the analyte assigned by the Chemical Abstracts Service.

4 Lot Number
Identification number for a specific lot of the product.

5 Expiry Date
Determined by real time and accelerated stability testing (dependent on format).

6 Storage Temperature
Describes optimal long-term storage conditions based on stability studies.

7 Storage and Handling
These are the minimum storage requirements based on stability studies.

8 Certified Values
Purity and associated uncertainty determined for this particular lot of this product.

9 Uncertainty
The expanded uncertainty contribution is calculated according to ISO Guide 34 / ISO 17034.

10 Analytical Data
Details of the methodology used to determine the purity of this particular lot. Analytical chromatograms are also supplied where appropriate on supplementary pages.

11 Traceability
Traceability back to SI unit is demonstrated for all products.

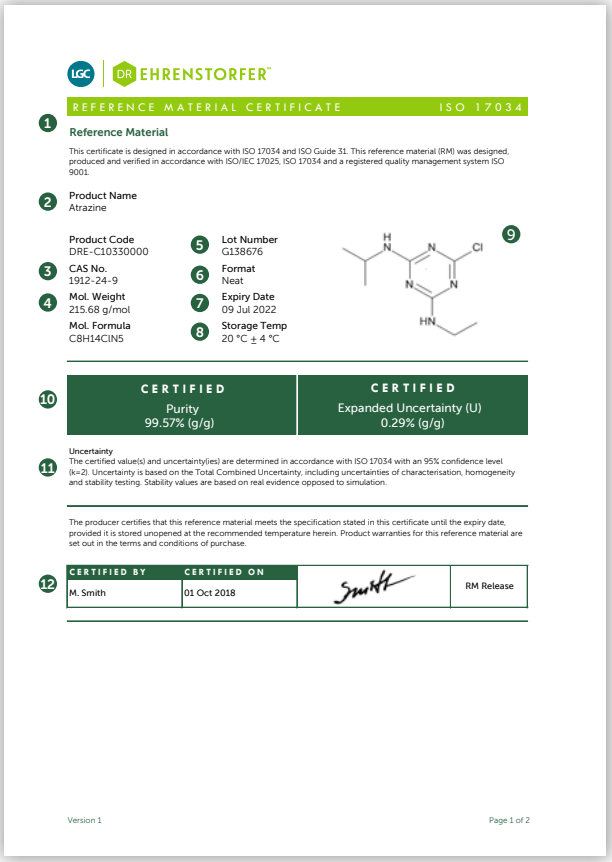
For certificates of solutions, the following information is included:

Gravimetric data
Concentration of the product, purity and the weight of product.

Solvent information
Identity, lot number and exact quantity of solvent used.

Traceability data
Identification of materials used including lot numbers for any neat and solution products used.

WHAT OUR CERTIFICATE OF ANALYSIS TELLS YOU



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REFERENCE MATERIAL CERTIFICATE ISO 17034

1 **Reference Material**

This certificate is designed in accordance with ISO 17034 and ISO Guide 31. This reference material (RM) was designed, produced and verified in accordance with ISO/IEC 17025, ISO 17034 and a registered quality management system ISO 9001.

2 **Product Name**
Atrazine

Product Code
DRE-C10330000

3 **CAS No.**
1912-24-9

4 **Mol. Weight**
215.68 g/mol

Mol. Formula
C8H14ClN5

5 **Lot Number**
G138676

6 **Format**
Neat

7 **Expiry Date**
09 Jul 2022

8 **Storage Temp**
20 °C ± 4 °C

9

10

CERTIFIED	CERTIFIED
Purity	Expanded Uncertainty (U)
99.57% (g/g)	0.29% (g/g)

11 **Uncertainty**
The certified value(s) and uncertainty(ies) are determined in accordance with ISO 17034 with an 95% confidence level (k=2). Uncertainty is based on the Total Combined Uncertainty, including uncertainties of characterisation, homogeneity and stability testing. Stability values are based on real evidence opposed to simulation.

The producer certifies that this reference material meets the specification stated in this certificate until the expiry date, provided it is stored unopened at the recommended temperature herein. Product warranties for this reference material are set out in the terms and conditions of purchase.

12

CERTIFIED BY	CERTIFIED ON		
M. Smith	01 Oct 2018	Smith	RM Release

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1 Accreditation/Quality Level
Accreditation and Quality level of the product clearly defined.

2 Product Name/Code
Unique identifiers for the product.

3 CAS No.
Unique identifier for the analyte assigned by the Chemical Abstracts Service.

4 Mol. Weight/Formula
Molecular weight and formula stated directly on certificate for ease of reference.

5 Lot Number
Identification number for a specific lot of the product.

6 Format
Identifies the product as a neat, a solution or a multicomponent solution.

7 Expiry Date
Determined by real time and accelerated stability testing (dependent on format).

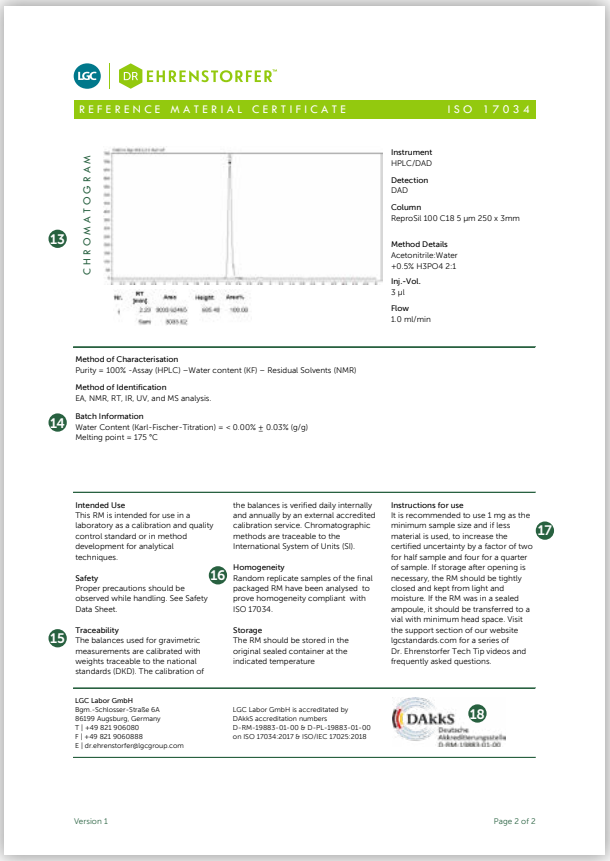
8 Storage Temperature
Describes optimal long-term storage conditions based on stability studies.

9 Chemical Structure
Provided for neats and single solutions to clearly define analyte.

10 Certified Values
Purity and associated uncertainty determined for this particular lot of this product. These are clearly displayed for you to easily identify.

11 Uncertainty
The expanded uncertainty contribution is calculated according to ISO 17034.

12 Certification Statement
Officially guarantees our confidence in the product.



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REFERENCE MATERIAL CERTIFICATE ISO 17034

13 CHROMATOGRAM

Instrument
HPLC/DAD

Detection
DAD

Column
ReproSil 100 C18 5 µm 250 x 3mm

Method Details
Acetonitrile:Water +0.5% H3PO4 2:1

Inj.-Vol.
3 µl

Flow
1.0 ml/min

Method of Characterisation
Purity = 100% -Assay (HPLC) –Water content (KF) – Residual Solvents (NMR)

Method of Identification
EA, NMR, RT, IR, UV, and MS analysis.

14 **Batch Information**
Water Content (Karl-Fischer-Titration) = < 0.00% ± 0.03% (g/g)
Melting point = 175 °C

Intended Use
This RM is intended for use in a laboratory as a calibration and quality control standard or in method development for analytical techniques.

Safety
Proper precautions should be observed while handling. See Safety Data Sheet.

15 **Traceability**
The balances used for gravimetric measurements are calibrated with weights traceable to the national standards (DKD). The calibration of the balances is verified daily internally and annually by an external accredited calibration service. Chromatographic methods are traceable to the International System of Units (SI).

16 **Homogeneity**
Random replicate samples of the final packaged RM have been analysed to prove homogeneity compliant with ISO 17034.

Storage
The RM should be stored in the original sealed container at the indicated temperature

Instructions for use
It is recommended to use 1 mg as the minimum sample size and if less material is used, to increase the certified uncertainty by a factor of two for half sample and four for a quarter of sample. If storage after opening is necessary, the RM should be tightly closed and kept from light and moisture. If the RM was in a sealed ampoule, it should be transferred to a vial with minimum head space. Visit the support section of our website lgcstandards.com for a series of Dr. Ehrenstorfer Tech Tip videos and frequently asked questions. 17

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LGC Labor GmbH is accreditated by DAkkS accreditation numbers D-RM-19883-01-00 & D-PL-19883-01-00 on ISO 17034:2017 & ISO/IEC 17025:2018

18 DAkkS Deutsche Akkreditierungsstelle D-RM-19883-01-00

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13 Chromatogram
Including analytical conditions are provided with nearly all products.

14 Batch Information
Describes production methods and further relevant information such as water content and isomeric ratios where applicable.

15 Traceability
Traceability back to SI unit is demonstrated for all products.

16 Homogeneity
An assessment of homogeneity for ISO 17034 products is provided.

17 Instructions for Use
Further tech tips to assist you in your analysis and handling of the product.

18 Stamp of Accreditation
Displayed on certificate for ISO 17034 products to confirm approval by our accreditation bodies (not included on ISO 17025 Reference Material certificates).

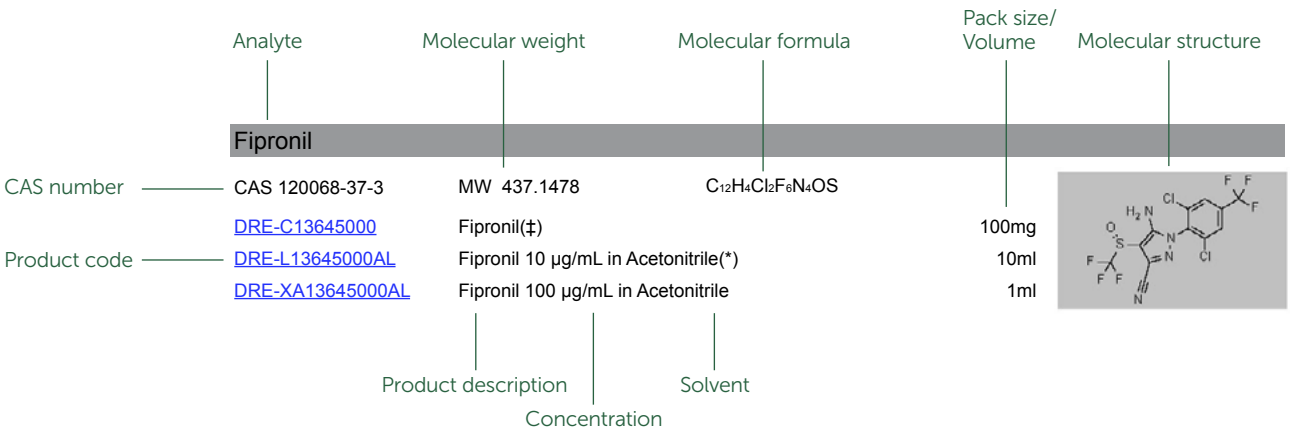
If you need additional copies of the current Certificates of Analysis for individual lots of products in the range, simply visit **lgcstandards.com** or contact your local office, where our technical staff are always happy to advise on the suitability of a specific product, and how to use it. You can find a full list of all our local offices within the inside back cover of this catalogue.

ISO 17034 Reference Material Certificate, 2019 - present

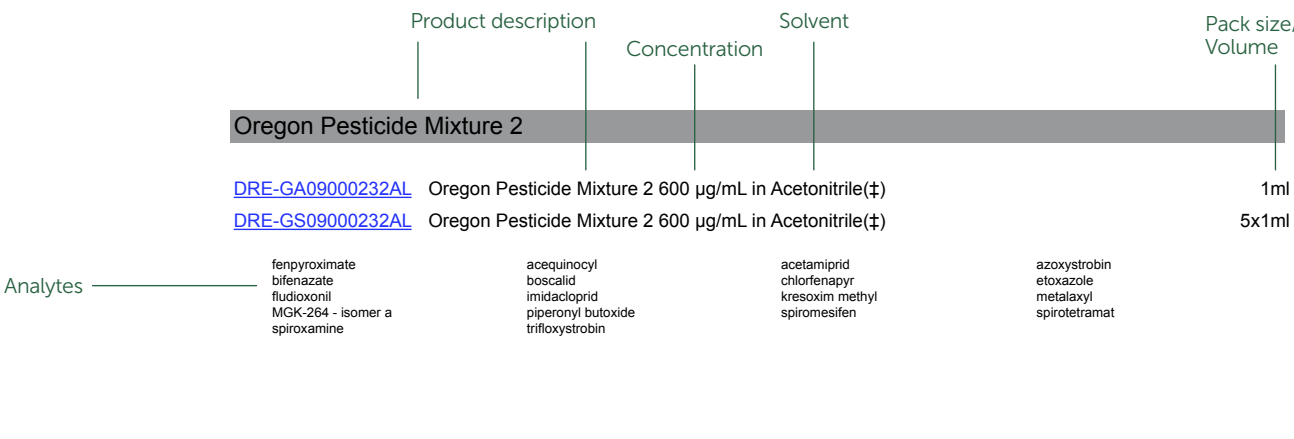
UNDERSTANDING OUR PRODUCT CATALOGUE

Dr. Ehrenstorfer is a leading manufacturer of pesticide standards and other organic reference materials. We typically have over 7,000 different products available, in a variety of formats, from neat materials to solutions of individual compounds and multicomponent solutions.

Neats & Single Solutions:



Multicomponent Solutions:



A global leader in measurement standards, reference materials, laboratory services and proficiency testing.

2,600

professionals working in

21

countries

We are the UK's designated National Measurement Institute for chemical and bioanalytical measurement.

With 2,600 professionals working in 21 countries, our analytical measurement and quality control services are second-to-none.

As a global leader, we provide the widest range of reference materials available from any single supplier.

When you make a decision using our resources, you can be sure it's based on precise, robust data. And together, we're creating fairer, safer, more confident societies worldwide.

Your global partner in quality control

LGC

DR EHRENSTORFER™