Certificate of Analysis – Certified Reference Material

Aquastar® Water Standard Oven 1%

Producer: Merck KGaA, Frankfurter Str. 250, 64293 Darmstadt, Germany
Product no.: 1.88054.0005
Lot no.: HC57768454
Description of CRM: Water Standard Oven 1%
Certified Reference Material for Karl Fischer oven technique, Aquastar®
Expiry date: 2028/11/30
Storage: +15°C to +25°C tightly closed in the original container
Composition: Potassium sulfate / sodium tungsten dihydrate

Analyte	Certified value as mass fraction	Associated uncertainty, $U=k\cdot u$ ($k=2$) as mass fraction
Water	**0.99%**	**±0.02%**
	9.9 mg/g	**±0.2 mg/g**

Metrological traceability: Directly traceable to SI Unit (kg).

Measurement method: The water content is determined by coulometric Karl Fischer oven method at 170°C and an extraction time of 600 s (n ≥ 10). The measurement value is additionally checked by thermogravimetry as independent procedure.

Intended use: Certified reference material for checking the accuracy of coulometric and volumetric water determinations using a Karl Fischer oven and thermobalances according to ISO 9001 chapter 7.1.5 "Monitoring and measuring resources".

Instructions for handling and correct use: The CRM should be stored in the original (unopened) bottle at room temperature (15-25°C). For the daily verification we recommend to accept a deviation of ± 0.03% (± 0.3 mg/g) from the certified value. See Details for correct use on page 2.

Accreditation: Merck KGaA, Darmstadt, Germany is accredited by the German accreditation authority DAkkS as registered reference material producer D-RM-15185-01-00 in accordance with ILAC-MRA and ISO 17034.

Certificate issue date: 2025/12/15

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-RM-15185-01-00

ISO 17034

CRM released by Approving Officer
or delegate of Quality Control

A. Yildirim

Dipl.-Ing. Ayfer Yildirim
Responsible Laboratory Manager

Health and safety information: Please refer to the Safety Data Sheet for detailed information about the nature of any hazard and appropriate precautions to be taken.

Details on correct use:

- The oven standard can be used in a temperature range of 150°C to 400°C.
- A minimum heating time (extraction time) of 300 sec is recommended.
- The weigh-in quantity for the KF oven technique is usually in the range of 80 mg to 300 mg.
- Setting parameters for the oven like minimum temperature and heating time as well as optimum sample size of the standard substance could vary depending on the used instrument.

Certification process details:

This Aquastar® Karl Fischer standard is prepared gravimetrically from high purity salts. All balances are regularly calibrated with analytical weight sets traceable to primary weights by PTB (Physikalisch Technische Bundesanstalt).

Characterisation of Aquastar® Water Standard Oven is carried out by the accredited quality control (QC) laboratory at Merck KGaA, Darmstadt, Germany according to DIN EN ISO / IEC 17025 by measuring the water content with coulometric Karl Fischer oven method.

Homogeneity and stability studies are performed with the material according to the requirements of ISO 17034 and ISO 33405.

Associated uncertainty:

The associated uncertainty U_{CRM} reported with the certified values is calculated as combined expanded uncertainty $U_{CRM}=k \cdot u_{CRM}$ in accordance with GUM and EA-4/02, with $k=2$ as the coverage factor for a 95% coverage probability.

The combined uncertainty u_{CRM} is derived from combination of the squared uncertainty contributions:

$$u_{CRM} = \sqrt{u^2_{characterisation} + u^2_{homogeneity} + u^2_{stability}}$$

$u_{characterisation}$: is the uncertainty in accordance with DIN EN ISO/IEC 17025 which includes e. g. contributions of the primary reference material and the measuring system. The characterisation measurements have been conducted by our DAkkS accredited calibration laboratory.

$u_{characterisation}$ in the certified value is calculated in accordance to EA-4/02 and GUM.

$U_{characterisation}$ is 0.003% (0.03 mg/g) (calculated as $U_{characterisation} = k \cdot u_{characterisation}$ with $k=2$)

$u_{homogeneity}$: is the between-bottle variation in accordance with ISO 17034. The assessment of homogeneity is performed by analysis of a representative number of systematically chosen sample units.

$u_{stability}$: is the uncertainty obtained from short-term and long-term stability in accordance with ISO 17034. The stability studies are the basis for the quantification of the expiry date of this water standard for the unopened bottle.

For more detailed information please read the certification report on our website.

Certificate of analysis revision history:

Certificate version	Date	Reason for version
01	2025/12/15	Initial version

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