# Certified Reference Material
## Reference material certificate

## Acetate Standard for IC

TraceCERT®
Traceable Certified Reference Materials

| | |
|---|---|
| **Product no.:** | 51791 |
| **Lot no.:** | BCCL6083 |
| **Description of CRM:** | Acetic acid (pure material) and sodium hydroxide solution suitable for trace analysis in high-purity water (18.2 MΩ·cm, 0.22 µm filtered). The bottled solution is stabilized with sodium azide (about 5 mg/L) and additionally filtered through a 0.2 µm membrane. |
| **Expiry date:** | FEB 2027 |
| **Storage:** | Store at 5°C-25°C |
| **Density (certified) at 20°C:** | 999.0 kg $m^{-3}$ ± 0.5 kg $m^{-3}$ |

| Constituent | Certified values at 20°C and expanded uncertainties, $U = k \cdot u$ ($k = 2$) [1][2] | |
|---|---|---|
| **Acetate** | **1001 mg $kg^{-1}$ ± 4 mg $kg^{-1}$** | **1000 mg $L^{-1}$ ± 5 mg $L^{-1}$** |

| | |
|---|---|
| **Metrological traceability:** | Directly traceable to NIST SRM 84l, potassium hydrogen phthalate. [3] |
| **Measurement method:** | The certified value is determined by high-precision weighing of starting materials characterized by acidimetric titration in accordance with ISO/IEC 17025.[4] |
| **Intended use:** | Calibration of ion chromatography or any other analytical technique. |
| **Instructions for handling and correct use:** | The bottle's temperature must be 20°C. Shake well before every use. If storage of a partially used bottle is necessary (at the user`s risk), the cap should be tightly sealed and the bottle should be stored at reduced temperature (e.g. refrigerator) to minimize transpiration rate. |
| **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. |
| **Packaging:** | 100 mL HDPE bottle |
| **Accreditation:** | Sigma-Aldrich Production GmbH is accredited by the Swiss Accreditation Service SAS as reference material producer under no. SRMS 0001 in accordance with international standard ISO 17034[5] |
| **Certificate issue date:** | 03 MAY 2024 |

**ISO 17034**
**SRMS 0001**

S. Matt – CRM Operations

Dr. P. Zell – Approving Officer

Sigma-Aldrich Production GmbH, Industriestrasse 25, 9471 Buchs, Switzerland;
Tel +41-81-755-2511; Fax +41-81-756-5449; www.sigmaaldrich.com
Sigma-Aldrich Production GmbH is a subsidiary of Merck KGaA, Darmstadt, Germany.

**Certification process details:**

The certified concentrations and expanded uncertainties of the analyte are based on the results obtained from gravimetrical production and from the analytical results determined using acid-base titration.

Gravimetric preparation using well defined and pure materials is a practical realization of concentration units, through conversion of mass to amount of substance [3]. All high-precision balances are periodically calibrated by a third party and certified according to DAkkS guidelines (DAkkS = Deutsche Akkreditierungsstelle GmbH, which is the national accreditation body for the Federal Republic of Germany).

Production and certification of this CRM are in accordance with **ISO 17034** [5]. Storage stability, leaching and homogeneity tests are also considered for certification.

**Details on metrological traceability:**

The content of the starting material was measured by volumetric acid-base titrations with carbonate free 1 mol/L NaOH-solution using a combined pH-electrode.

Seven starting material samples and seven reference material samples are prepared separately and then titrated in one set. All results are traced gravimetrically to National Bureau of Standards (NIST) Standard Reference Material 84l acidimetric standard, potassium hydrogen phthalate (99.9934%).

| Starting material | Starting material content with expanded uncertainty | Traceable to |
|---|---|---|
| **Acetic acid**<br>P/N 33209<br>Lot STBK1980 | **99.82% +/- 0.17%** | NIST SRM 84l, potassium hydrogen phthalate |

**Homogeneity assessment:**

Due to the production process, a homogeneous solution derives. Nevertheless a small homogeneity contribution is included into the calculation of content uncertainty of this CRM.

**Stability assessment:**

Two major contributors to the overall stability of this CRM were evaluated in deep. The mass loss due to evaporation is driven by the storage temperature and the geometry and the material of the bottle used. The bottles were tested for long term weight loss due to evaporation at different temperatures. The effect was taken into account in the uncertainty contribution of the storage stability. The microbiological stability was assessed with microbiological testing of the bottled solution. No biological contamination could be detected.

**Density Measurement:**

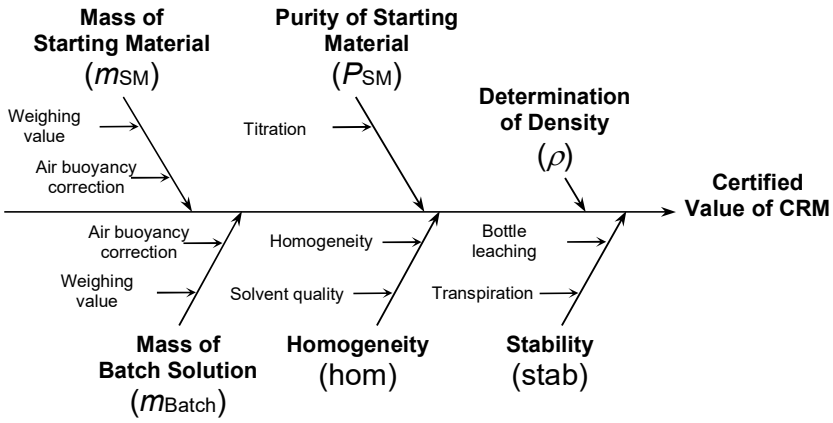
The density measurement is carried out under the scope of the ISO/IEC 17025 [4] accreditation according to ISO 15212-1 [6] and using the digital density meter DMA 4500M from Anton Paar with an oscillating U-tube installed. The measurement uncertainty is calculated according to Eurachem/CITAC Guide and reported as combined expanded uncertainty at the 95% confidence level, using a coverage factor of $k = 2$.

**Uncertainty evaluation:**

The uncertainty contributions are illustrated by the following cause-effect diagram [7]:

Typical relative contributions are:

| | |
|---|---|
| $u(m_{SM})$ | < 0.01 % |
| $u(m_{Batch})$ | < 0.01 % |
| $u(P_{SM})$ | < 0.10 % |
| $u_{hom}$ | < 0.03 % |
| $u_{stab}$ | < 0.20 % |
| $u(\rho)$ | < 0.05 % |




The combined standard uncertainty is calculated by combination of the standard uncertainties of the input estimates according to Eurachem/CITAC Guide "Quantifying Uncertainty in Analytical Measurement" and ISO 17034.[2][5]

Expanded uncertainty is then calculated to a confidence level of 95%, typically by multiplying with a confidence level factor of $k$=2.

**References:**


[1] ISO Guide 35:2017, "Reference materials - Guidance for characterization and assessment of homogeneity and stability"
[2] Eurachem/CITAC Guide, 3rd Ed. (2012), "Quantifying uncertainty in analytical measurement"
[3] Eurachem/CITAC Guide, 2nd Ed. (2019), "Metrological Traceability in chemical measurement"
[4] The accredited testing laboratory STS 0490 performs the measurements and weighing steps for the certification of this CRM under ISO/IEC 17025:2017, "General requirements for the competence of testing and calibration laboratories"
[5] ISO 17034:2016, "General requirements for the competence of reference material producers"
[6] DIN EN ISO 15212-1:1998, Oscillation-type density meters - Part 1: Laboratory instruments
[7] Reichmuth, A., Wunderli, S., Weber, M., Meyer, V. R. (2004), "The uncertainty of weighing data obtained with electronic analytical balances", Microchimica Acta 148: 133-141.


**Certificate of analysis revision history:**

| Certificate version | Certificate issue date | Reason for version |
|---|---|---|
| 01 | 03 MAY 2024 | Initial version |

**Disclaimer:**

The purchaser must determine the suitability of this product for its particular use. Sigma-Aldrich Production GmbH makes no warranty of any kind, express or implied, other than its products meet all quality control standards set by Sigma-Aldrich Production GmbH. We do not guarantee that the product can be used for a special application.