Reference Material Certificate

Product Type: Conductivity Calibration/Verification Standard

Catalogue Number: A-3410-030

25µS/cm Conductivity Calibration Solution

Lot Number:	A-1692401-09
Certified Value:	25.23µS/cm ± 0.25µS/cm at 25°C
Expanded Uncertainty:	U = ± 0.25µS/cm
Reference Value:	N/A
Source Material:	Fisher HCl (Hydrochloric Acid), 2041566
Container:	30mL PPCO Vial
Storage/Refrigeration:	Store in original container at 1-25°C
Preservative:	N/A
Additional Information:	Hazardous – Please refer to SDS.

Certificate Issue Date: 06 Mar 2025

Expiry Date: 01 Jun 2025

Certifying Officer: Charlotte Trinick
Lead Quality Manager

C. Trinick

Intended Use: This Certified Reference Material (CRM) is intended for use as a Calibration Standard for the determination of the conductivity cell constant, or as a control sample. Electrolytic conductivity is strongly dependent on temperature, therefore it is necessary to keep the temperature constant within the measurement cells (variation less than 0.1 K). This CRM can be used for calibration or verification purposes and to help meet the requirements of USP Chapter 645 & EP Chapter 2.2.38.

Certified Value: CRMs are manufactured to **ISO 17034** [4] and certified to **ISO/IEC 17025** [3]. The Certified Value is established through an analysis of a statistically significant number of samples taken during manufacturing process. Conductivity Calibration Standards consist of the source material mixed with ultrapure, filtered, deionised water. After preparation, the solution is allowed to equilibrate with atmospheric carbon dioxide. The certified value is based on this equilibrium condition. The Conductivity Calibration Standard should not be degassed before use.

Metrological Traceability: This is a dilute solution of Hydrochloric Acid (HCl) sourced from Fisher Scientific. This is traceable to the Primary Reference Material KCl, characterised by the National Institute of Standards and Technology (NIST). All balances and check weights used are calibrated by a UKAS ISO/IEC 17025 Calibration Laboratory, providing traceability of measurement to the SI and/or to units of measurement realised at the National Physical Laboratory. Instrumentation used for analytical verification of this CRM is calibrated using standards traceable to Standard Reference Materials certified by NIST.

Measurement Method: Altus Science use a documented in-house method using a conductivity meter. Analytical verification of this product meets the acceptance criteria set by Altus Science.

Instructions for Use: CRMs should be kept in the original shipping container and stored in accordance with the storage/refrigeration instructions upon receipt. Prior to use, CRMs should be removed from storage, allowed to stabilise to ambient temperature and inverted three times. The single use container should remain tightly closed prior to use. Avoid contaminating open containers.

Period of Validity: Certified values are monitored, and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this CRM during the period of validity. Altus Science CRMs are intended for single use only. The fitness for purpose of the material cannot be guaranteed after single use or beyond the expiry date shown above.

Accreditation: Altus Science (Laboratory ID: 8020) is accredited by the United Kingdom Accreditation Service (UKAS) as a Reference Material Producer to ISO 17034:2016, and to ISO 17025:2017 as a Testing Laboratory.

Contents of Certificates and Labels comply with the requirements of ISO 33401:2024 [5].

UKAS REFERENCE MATERIALS 8020

Altus Science Limited, Park House, Manor Park Avenue, Manor Park, Runcorn, Cheshire, WA7 1TL, United Kingdom
P: +44(0) 1928 238 000 / E: info@altusscience.com

Altus science Reference Material Certificate

Homogeneity Assessment: Homogeneity was assessed in accordance with ISO Guide 35[1]. Completed units were sampled using a random sampling protocol. The results of analysis were then compared by Single Factor Analysis of Variance (ANOVA). Uncertainty due to the degree of homogeneity was derived using ANOVA (Homogeneity Uncertainty Contribution = $\sqrt{u^2}_{\text{Homogeneity}}$). Heterogeneity was not detected under the conditions of the ANOVA.

Expanded Uncertainty U_{CRM}: Uncertainty values in this document are expressed as Expanded Uncertainty. The reported Expanded Uncertainty is based on the combined uncertainty multiplied by a coverage factor, k= 2, providing a confidence level of 95%. The components of combined standard uncertainty include uncertainties due to characterisation, homogeneity, long term stability (storage), and short term stability (transport) as appropriate. The Expanded Uncertainty applies to the product as supplied [1, 2].

$$U_{CRM} = \sqrt{\boldsymbol{u}^2_{\text{Characterisation}} + \boldsymbol{u}^2_{\text{Homogeneity}} + \boldsymbol{u}^2_{\text{Stability}}}$$

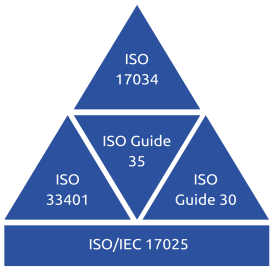
u Characterisation is the uncertainty in accordance with ISO/IEC 17025 which includes contributions from the primary reference material, temperature and the measuring system.

u Homogeneity is the between-bottle variation in accordance with ISO 17034. Assessment of homogeneity is performed by analysis of a representative number of randomly sampled units.

u Stability is the uncertainty obtained from short-term and long-term stability in accordance with ISO 17034. Stability studies are the basis for quantification of the expiry date of this Reference Material for the unopened container.

References:
1) ISO Guide 35:2017(E), Reference Materials-General and Statistical Principles for Certification.
2) ISO/IEC Guide 98-3:2008, Uncertainty of Measurement –Part 3: Guide to the Expression of Uncertainty in Measurement (GUM:1995).
3) ISO/IEC 17025:2017(E), General Requirements for the Competence of Testing and Calibration Laboratories.
4) ISO 17034:2016(E), General Requirements for the Competence of Reference Material Producers.
5) ISO 33401:2024(E), Reference Materials - Contents of Certificates, Labels and Accompanying Documentation.

Further Information: Additional Reference Material Certificates, Safety Data Sheets and information on the full range of Altus Science products can be found at **www.altusscience.com** or email **info@altusscience.com**.



ISO 17034: Accreditation as a Reference Material Producer
ISO Guide 35: Outlines principles for calculating the uncertainty of the certified value
ISO 33401: Describes the contents of the reference material certificate and accompanying documentation
ISO Guide 30: Confirms that standards are characterised according to CRM definition
ISO/IEC 17025: Accreditation as a Testing Laboratory