Altus science

Reference Material Certificate

Product Type:	Total Organic Carbon Calibration/Verification/Standard Solution
Catalogue Number:	A-4701-125

Calibration & Linearity Blank

Lot Number:	A-3402201-49
Certified Value:	TOC ≤ 0.100mg/L C
Expanded Uncertainty:	U = ±0.014mg/L C
Reference Value:	0.025mg/L C
Source Material:	N/A
Container:	125mL HDPE bottle
Storage/Refrigeration:	Store in original container at 5 ± 4°C
Preservative:	N/A
Additional Information:	Please refer to SDS

Certificate Issue Date:	09 Dec 2022
Expiry Date:	11 Mar 2023

Certifying Officer:	Debbie Roscoe Executive Director	DJRoscoe

Intended Use: This low level TOC water is intended for use in the calibration and testing of Total Organic Carbon analysers, and is used in the preparation of Altus Science Certified Reference Materials (CRM). This may be used to verify Total Carbon (TC = TIC + TOC) or, for analysers that compensate for Inorganic Carbon (IC), to verify Total Organic Carbon (TOC = TC − IC). The expanded uncertainty value *(U)* applies to both certified parameters.

Certified Value: CRMs are manufactured to **ISO 17034** [4] and verified to **ISO/IEC 17025** [3]. Calibration Blank Standards consist of ultrapure, filtered, deionised water, with an initial TOC no greater than 0.040mg/L C at the point of production.

Metrological Traceability: All balances and check weights used for calibration of volumetric glassware 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 comprising UV persulphate oxidation followed by CO_2 detection, using membrane-based conductivity. 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 Guide 31:2015 [5].

UKAS
REFERENCE
MATERIALS
8020

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Homogeneity Assessment: Homogeneity was assessed in accordance with ISO Guide 35[1]. Completed units were sampled using a random sampling protocol. The results of chemical 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 $= \sqrt{u^2_{Homogeneity}}$). 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].

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

$u_{Characterisation}$ 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 Guide 31:2015(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**.
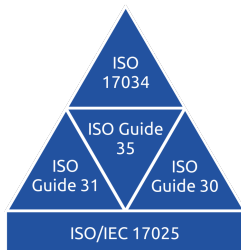
ISO 17034: Accreditation as a Reference Material Producer
ISO Guide 35: Outlines principles for calculating the uncertainty of the certified value
ISO Guide 31: Describes the contents of the reference material certificate and accompanying documentation
ISO Guide 30: Confirms that standards are characterised according to CRM definition
ISO/IEC 17025: Accreditation as a Testing Laboratory