



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: November 30, 2024

Certificate Number: 6829.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations:¹

I. Chemical

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|--|--|---|
| Gas Analyzer ³ – Concentration: | | | CEM QU-006 Ed. 0 by dynamic dilution. |
| CO in N ₂ | Carbon Monoxide (CO): (2 to 10) µmol/mol | $(-1.6 \cdot 10^{-4}(c)^4 + 3.7 \cdot 10^{-3}(c)^3 - 3 \cdot 10^{-2}(c)^2 + 1.1 \cdot 10^{-1}(c) - 7.1 \times 10^{-2})$ µmol/mol | Where (c) is gas concentration in unit of µmol/mol, or nmol/mol. |
| NO ₂ in N ₂ | Nitric Dioxide (NO ₂): (50 to 250) nmol/mol | $(-2.4 \cdot 10^{-9}(c)^4 + 1.4 \cdot 10^{-6}(c)^3 - 2.4 \cdot 10^{-4}(c)^2 + 2.2 \cdot 10^{-2}(c) + 4.5)$ nmol/mol | |
| | (250 to 500) nmol/mol | $(-1.7 \cdot 10^{-9}(c)^4 + 2.8 \cdot 10^{-6}(c)^3 - 1.7 \cdot 10^{-3}(c)^2 + 4.3 \cdot 10^{-1}(c) - 35)$ nmol/mol | |
| NO in N ₂ | Nitric Monoxide (NO): (50 to 250) nmol/mol | $(-2.3 \cdot 10^{-9}(c)^4 + 1.4 \cdot 10^{-6}(c)^3 - 2.4(c)^2 + 2.3 \cdot 10^{-2}(c) + 4.5)$ nmol/mol | |
| | (250 to 500) nmol/mol | $(4.2 \cdot 10^{-9}(c)^4 - 6.8 \cdot 10^{-6}(c)^3 + 4.1 \cdot 10^{-3}(c)^2 - 1.1(c) + 110)$ nmol/mol | |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|---|---|---|---|
| Gas Analyzer ³ – Concentration: (cont) | | | CEM QU-006 Ed. 0 by dynamic dilution. |
| H ₂ S in N ₂ | Hydrogen Sulfide (H ₂ S): (25 to 500) nmol/mol | $(1.3 \cdot 10^{-10} (c)^4 - 1.6 \cdot 10^{-7} (c)^3 + 8.6 \cdot 10^{-5} (c)^2 + 9.7 \cdot 10^{-3} (c) + 3.8)$ nmol/mol | Where (c) is gas concentration in unit of μ mol/mol, or nmol/mol. |
| SO ₂ in N ₂ | Sulfur Dioxide (SO ₂): (25 to 250) nmol/mol (250 to 500) nmol/mol | $(-1.7 \cdot 10^{-9} (c)^4 + 9.3 \cdot 10^{-7} (c)^3 - 1.4 \cdot 10^{-4} (c)^2 + 3.1 \cdot 10^{-2} (c) + 7.5 \cdot 10^{-1})$ nmol/mol $(-1.4 \cdot 10^{-9} (c)^4 + 2.3 \cdot 10^{-6} (c)^3 - 1.4 \cdot 10^{-3} (c)^2 + 3.8 \cdot 10^{-1} (c) - 31)$ nmol/mol | |
| Gas Analyzer ³ Ozone Concentration | Ozone (O ₃): (50 to 500) nmol/mol | $(-1.4 \cdot 10^{-6} (c)^2 + 5.8 \cdot 10^{-2} (c) + 7.2 \cdot 10^{-1})$ nmol/mol | Standard ultraviolet photometer Where (c) is gas concentration |
| Gas Analyzer – Mercury Concentration | (100 to 20 000) ng/m ³ | $(0.020x + 2.5)$ ng/m ³ | Cold-vapor mercury technique using gravimetric dilutions from a mercury CRM. Where x is mercury concentration in ng/m ³ |
| Turbidimeter | (10 to 1000) NTU | $(0.051x + 0.052)$ NTU | Comparison to stabilized Formazin turbidity standard Where x is turbidity in NTU |
| Dissolved Oxygen – Measuring Devices | (5.2 to 9.4) mg/L | 0.02 mg/L | Comparison to oxygen saturated water at controlled temperature using Benson-Krausen equation. |

II. Fluid Quantities

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|---------------------------------------|--|--|
| Volume Flow Rate – Gas Flowmeters | (50 to 5000) cm ³ /min | $(4.8 \cdot 10^{-14} (Q)^4 + 3.2 \cdot 10^{-10} (Q)^3 - 3.2 \cdot 10^{-7} (Q)^2 + 0.0015 (Q) + 5.9) \text{ cm}^3/\text{min}$ | CEM ME-009: “Procedimiento para la calibración de caudalímetros de gases”, Ed. digital 1 |
| | (5000 to 20 000) cm ³ /min | $(5.7 \cdot 10^{-11} (Q)^3 - 2.6 \cdot 10^{-6} (Q)^2 + 0.039 (Q) - 82) \text{ cm}^3/\text{min}$ | Where (Q) is volume flow rate in cm ³ /min |
| Volume Flow Rate – High Volume Air Samplers | (1.1 to 1.3) m ³ /min | 2.6 % of reading | Indirect calibration using two differential pressure digital gauges |

¹ This laboratory offers commercial calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC Uncertainty due to the behavior of the customer’s device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer’s site being larger than the CMC.

⁴ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.