SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: December 31, 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:			
CO in N_2	Carbon Monoxide (CO): (2 to 10) µmol/mol	$(-1.6\cdot10^{-4}(c)^4 + 3.7\cdot10^{-3}(c)^3 - 3\cdot10^{-2}(c)^2 + 1.1\cdot10^{-1}(c) - 7.1x10^{-2})$ µmol/mol	CEM QU-006 Ed. 0 by dynamic dilution.
NO_2 in N_2	Nitric Dioxide (NO_2): (50 to 250) nmol/mol	$(-2.4\cdot10^{-9}(c)^4 + 1.4\cdot10^{-6}(c)^3 - 2.4\cdot10^{-4}(c)^2 + 2.2\cdot10^{-2}(c) + 4.5)$ nmol/mol	Where (c) is gas concentration in unit of µmol/mol, or nmol/mol.
	(250 to 500) nmol/mol	$(-1.7\cdot10^{-9}(c)^4 + 2.8\cdot10^{-6}(c)^3 - 1.7\cdot10^{-3}(c)^2 + 4.3\cdot10^{-1}(c) - 35)$ nmol/mol	
NO in N_2	Nitric Monoxide (NO): (50 to 250) nmol/mol)	$(-2.3\cdot10^{-9}(c)^4 + 1.4\cdot10^{-6}(c)^3 - 2.4\cdot10^{-4}(c)^2 + 2.3\cdot10^{-2}(c) + 4.5)$ nmol/mol	
	(250 to 500) nmol/mol	$(4.2\cdot10^{-9}(c)^4 - 6.8\cdot10^{-6}(c)^3 + 4.1\cdot10^{-3}(c)^2 - 1.1(c) + 110)$ nmol/mol	

Parameter/Equipment	Range	CMC[2,4] (±)	Comments
Gas Analyzer [3] – Concentration: (cont)			
H_2S in N_2	Hydrogen Sulfide (H_2S): (25 to 500) nmol/mol	$(1.3\cdot10^{-10}\,(c)^4 - 1.6\cdot10^{-7}(c)^3 + 8.6\cdot10^{-5}\,(c)^2 + 9.7\cdot10^{-3}\,(c) + 3.8)$ nmol/mol	CEM QU-006 Ed. 0 by dynamic dilution. Where (c) is gas concentration in unit of µmol/mol, or nmol/mol.
SO_2 in N_2	Sulfur Dioxide (SO_2): (25 to 250) nmol/mol	$(-1.7\cdot10^{-9}\,(c)^4 + 9.3\cdot10^{-7}\,(c)^3 - 1.4\cdot10^{-4}\,(c)^2 + 3.1\cdot10^{-2}\,(c) + 7.5\cdot10^{-1})$ nmol/mol	
	(250 to 500) nmol/mol	$(-1.4\cdot10^{-9}\,(c)^4 + 2.3\cdot10^{-6}\,(c)^3 - 1.4\cdot10^{-3}\,(c)^2 + 3.8\cdot10^{-1}\,(c) - 31)$ nmol/mol	
Gas Analyzer [3] Ozone Concentration	Ozone (O_3): (50 to 500) nmol/mol	$(-1.4\cdot10^{-6}\,(c)^2 + 5.8\cdot10^{-2}\,(c) + 7.2\cdot10^{-1})$ 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 – Air Flowmeters	(5 to 20) cm^3/min (20 to 100) cm^3/min (100 to 500) cm^3/min (500 to 1000) cm^3/min (1000 to 10000) cm^3/min (10000 to 20000) cm^3/min	1.2 cm^3/min 1.3 cm^3/min 1.9 cm^3/min 3.5 cm^3/min $0.003Q + 0.68$ cm^3/min 62 cm^3/min	CEM ME-009 by comparison with reference flowmeter. Where (Q) is volume flow rate in cm^3/min. Air flow reference conditions: temperature at 0 °C and absolute pressure at 1013.25 mbar.
Volume Flow Rate – Personal Sampling Pumps	(5 to 20) cm^3/min (20 to 100) cm^3/min (100 to 500) cm^3/min (500 to 1000) cm^3/min (1000 to 10000) cm^3/min (10000 to 20000) cm^3/min	0.14 cm^3/min 0.32 cm^3/min 2.4 cm^3/min 3.5 cm^3/min 0.6 % of reading 61 cm^3/min	CEM ME-009 by comparison with reference flow meter. Air flow reference conditions: temperature at 0 °C and absolute pressure at 1013.25 mbar.
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

III. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Absolute Pressure – Barometers	(550 to 1100) hPa	0.67 hPa	INACAL PC-024:2018

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature – Digital Thermometers	(-30 to 80) °C	0.0064 % rdg + 0.090 °C (0.087 °C to 0.094 °C)	SNM-INDECOPI PC-017, 2nd ed. 2012
Temperature Controlled Chambers[3]	(-30 to 100) °C	0.2 °C	S&M-INDECOPI PC-018, 2nd ed. 2009
Temperature – Liquid Baths	(-30 to 100) °C	0.2 °C	S&M-INDECOPI PC-019, 1st ed. 2009
Temperature – Thermohygrometers	(12 to 40) °C	0.55 °C	INACAL PC-026: 2019
Relative Humidity – Thermohygrometers	(15 to 40) % rh (40 to 80) % rh	2.9 % rh – 0.016RH 1.9 % rh + 0.0075RH	INACAL PC-026: 2019

[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.