SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: December 31, 2022 Certificate Number: 6032.01

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

I. Acoustics

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Sound Level Meters – Class I & Class II			
Acoustic Calibration (94, 114) dB	1000 Hz	0.21 dB	PC-023 procedure for calibration of sound level meters. First edition - January 2017. INACAL
Electric Calibration (10 to 150) dB	(20 to 20 000) Hz	0.27 dB	

II. Chemical

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Gas Analyzer –			MVAL-LAB-1: calibration of gas analyzer in air quality. Rev. 00: 2020 ALAB
CO-Balance N_2	0.13 x 10^{-6} to 54 x 10^{-6}	0.024 x 10^{-6}	Dynamic dilution
NO-Balance N_2	0.250 x 10^{-6} to 53 x 10^{-6}	0.74 x 10^{-9}	

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Gas Analyzer – (cont)			MVAL-LAB-1: calibration of gas analyzer in air quality. Rev. 00: 2020 ALAB
SO_2-Balance N_2	(100 x 10^{-9} to 54 x 10^{-6}) SO_2	0.77 x 10^{-9} SO_2	Dynamic dilution
NO_2-Air Balance N_2	(100 x 10^{-9} to 2.4 x 10^{-6}) NO_2	1.7 x 10^{-9} NO_2	
H_2S-Balance N_2	(15 x 10^{-9} to 0.5 x 10^{-6}) H_2S	1.7 x 10^{-9} H_2S	
Combustion Gas Analyzer –			MVAL-LAB-4: calibration procedure of emission gas analyzer. Rev. 00: 2020 ALAB
CH_4-Air Balance N_2	2.5 %	0.025 % rdg	
CO	1015 x 10^{-6} CO 508 x 10^{-6} CO 50.5 x 10^{-6} CO	8.1 x 10^{-6} CO 7.9 x 10^{-6} CO 0.59 x 10^{-6} CO	Direct comparison
NO	984.8 x 10^{-6} NO 45.1 x 10^{-6} NO	7.1 x 10^{-6} NO 0.82 x 10^{-6} NO	
SO_2	1000 x 10^{-6} SO_2 45.7 x 10^{-6} SO_2	10 x 10^{-6} SO_2 0.61 x 10^{-6} SO_2	
NO_2	44 x 10^{-6} NO_2	0.82 x 10^{-6} NO_2	
O_2	18 %	0.16 % rdg	
H_2S	10.5 x 10^{-6} H_2S	0.094 x 10^{-6} H_2S	
Conductivity Meters[3]	1 µS/cm 5 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm 1413 µS/cm 10 000 µS/cm	0.62 µS/cm 0.62 µS/cm 0.62 µS/cm 2.1 µS/cm 4.8 µS/cm 6.2 µS/cm 40 µS/cm	PC-022 procedure for the calibration of conductometers. First edition 2014. Indecopi
pH Meters[3]	4 pH 7 pH 10 pH	0.012 pH 0.012 pH 0.012 pH	PC-020 procedure for the calibration of pH meters. Second edition 2017. INACAL

III. Dimensional

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Ruler	Up to 1000 mm	00.17 mm	MVAL-LAB-9 Class II ruler calibration procedure
EC Class II & III Tape Measures	Up to 5 m	0.14 mm	MVAL-LAB-10 Class II & III tape measure calibration procedure
Outside Micrometers	Up to 400 mm	1.5 µm	MVAL-LAB-11 outside micrometer calibration procedure
Vernier Caliper	Up to 1000 mm	6.5 µm	PC-012 procedure of calibration for Pie de Rey. 5th Edition: 2012 INDECOPI / SNM

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
DC Voltage – Generate	Up to 200 mV (200 to 400) mV (400 to 2000) mV (2000 to 4000) mV (4 to 950) V	0.11 mV 0.23 mV 1.1 mV 2.3 mV 0.59 V	PC-021 procedure for the calibration of digital multimeters edition 2: 2016 DM-INACAL

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
DC Current – Generate	(20 to 40) µA (40 to 200) µA (200 to 400) µA (400 to 2000) µA (2 to 4) mA (4 to 20) mA (20 to 40) mA (0.18 to 0.9) A (0.9 to 2.25) A (2.5 to 4.5) A (4.5 to 9) A (9 to 18) A	0.046 µA 0.23 µA 0.46 µA 2.3 µA 0.52 mA 0.75 mA 0.047 mA 0.057 A 0.058 A 0.058 A 0.059 A 0.062 A	PC-021 procedure for the calibration of digital multimeters edition 2: 2016 DM-INACAL
Resistance – Generate	(20.0 to 180) kΩ (0.2 to 1.8) kΩ (2 to 18) kΩ	1.0 kΩ 0.14 kΩ 0.17 kΩ	PC-021 procedure for the calibration of digital multimeters edition 2: 2016 DM-INACAL
Insulation Resistance Generate –			
Megohmmeter – Fixed Points	(1 to 10) kΩ (10 to 100) kΩ (100 to 1000) kΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1000) MΩ (1 to 10) GΩ (10 to 100) GΩ (100 to 1000) GΩ	0.044 kΩ 0.12 kΩ 1.2 kΩ 0.35 MΩ 1.2 MΩ 12 GΩ 0.64 GΩ 5.8 GΩ 58 GΩ	EL-004 megohmmeter calibration procedure
Tellurometer – Generate	(20.0 to 180) Ω (0.2 to 1.8) kΩ (2 to 18) kΩ (20 to 180) kΩ (100 to 1000) kΩ	0.89 Ω 0.14 kΩ 0.16 kΩ 0.89 kΩ 1.2 kΩ	MVAL-LAB-17 calibration procedure for tellurometer, rev. 00:2021 ALAB

Parameter/Range	Frequency	CMC[2, 5, 7] (±)	Comments
AC Voltage – Generate (200 to 400) mV (400 to 2000) mV (2000 to 4000) mV (4 to 20) V (20 to 100) V (100 to 200) V (200 to 500) V (500 to 950) V	60 Hz	 2.3 mV 11 mV 23 mV 0.22 V 0.3 V 0.31 V 0.40 V 0.62 V	PC-021 procedure for the calibration of digital multimeters edition 2: 2016 DM-INACAL
AC Current – Generate (2 to 4) mA (4 to 20) mA (20 to 40) mA (40 to 200) mA	60 Hz	 0.024 mA 0.11 mA 0.23 mA 1.1 mA	PC-021 procedure for the calibration of digital multimeters edition 2: 2016 DM-INACAL

V. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Volume – Burette	 Up to 1 mL Up to 2 mL Up to 5 mL Up to 10 mL (d=0.02 mL) Up to 10 mL (d=0.05 mL) Up to 25 mL Up to 50 mL	 0.0013 mL 0.0019 mL 0.0020 mL 0.0023 mL 0.0028 mL 0.0048 mL 0.0070 mL	PC-015 calibration procedure for volumetric glass & plastic material. 5th edition 2017. INACAL Note: intermediate volumes will take the immediate higher uncertainty

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Volume – (cont)			
One & Two Stroke Pipettes	1 mL 2 mL 5 mL 10 mL 20 mL 25 mL 50 mL 100 mL	0.0011 mL 0.0018 mL 0.0028 mL 0.0022 mL 0.0027 mL 0.0031 mL 0.0058 mL 0.0098 mL	PC-015 calibration procedure for volumetric glass & plastic material. 5th edition 2017. INACAL Note: intermediate volumes will take the immediate higher uncertainty
One-Mark Flasks	1 mL 2 mL 5 mL 10 mL 20 mL 25 mL 50 mL 100 mL 200 mL 250 mL 500 mL 1000 mL 2000 mL	0.0039 mL 0.0044 mL 0.0050 mL 0.0049 mL 0.0052 mL 0.0053 mL 0.0076 mL 0.0097 mL 0.020 mL 0.020 mL 0.034 mL 0.060 mL 0.13 mL	
Graduated Pipette	Up to 0.1 mL Up to 2 mL Up to 5 mL Up to 10 mL Up to 20 mL Up to 25 mL	0.0012 mL 0.0021 mL 0.0031 mL 0.0046 mL 0.011 mL 0.016 mL	
Pycnometers	10 mL 25 mL 50 mL 100 mL	0.0009 mL 0.0020 mL 0.0030 mL 0.0058 mL	
Graduated Measuring Cylinders	Up to 5 mL Up to 10 mL Up to 25 mL Up to 50 mL Up to 100 mL Up to 250 mL Up to 500 mL Up to 1000 mL Up to 2000 mL	0.020 mL 0.021 mL 0.023 mL 0.098 mL 0.090 mL 0.016 mL 0.30 mL 0.74 mL 0.82 mL	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Volume – (cont)			
Imhoff Cone	Up to 100 mL (100 to 1000) mL	U(X) = 9.25E-03 X + 1.62E-01 U(X) = 1.43E-03 X + 9.44E-01 X = nominal volume (mL)	PC-015 calibration Procedure for Volumetric glass & plastic material. 5th edition 2017, INACAL Note: intermediate volumes will take the immediate higher uncertainty
Piston Micropipettes	1 µL Up to 2.5 µL Up to 10 µL Up to 20 µL Up to 100 µL Up to 200 µL Up to 1000 µL Up to 5000 µL Up to 10 000 µL	0.052 µL 0.073 µL 0.085 µL 0.046 µL 0.34 µL 0.29 µL 1.6 µL 6.6 µL 15 µL	PC-027 procedure for the calibration of piston pipettes. 1st edition 2019. INACAL Note: intermediate volumes will take the immediate higher uncertainty
Piston Apparatus (Piston Burettes & Dispensers)	Up to 1 mL (>1 to 2) mL (>2 to 5) mL (>5 to 10) mL (>10 to 25) mL (>25 to 50) mL	0.000 22 mL 0.000 44 mL 0.0011 mL 0.0058 mL 0.0059 mL 0.011 mL	MVAL-LAB-19 procedure for the calibration of piston-actuated volumetric instruments, Rev. 00:2021 ALAB
Metallic Volumetric Meters	5 gal	0.03 % of the nominal value	MVAL-LAB-3 calibration procedure for metallic volumetric meters (volumetric method) ALAB Rev. 00: 2020 (based on the Peruvian metrological standard NMP 009: 1999 "measurement systems for liquids other than water: standard volumetric meters")
Flow Rate[3] – Gas			
Flowmeters	(0.055 to 30) L/min	0.013 L/min	Procedure ME-009 for the calibration of gas flow meters. Digital edition 1. CEM-Spain

VI. Mechanical

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Balances[3] –			PC-011 calibration procedure for non-automatic Class I & II balances. Fourth edition 2010-INDECOPI *X*: balance indication in g
Balance Class I	(0 to 1100) g	$(5.4 \times 10^{-6} X + 4.7 \times 10^{-6})$ g	
Balance Class II	(0 to 8200) g	$(4.4 \times 10^{-6} X + 1.1 \times 10^{-2})$ g	
Balance Class III & IIII	(0 to 150) kg	$(1.2 \times 10^{-1} X + 1.3 \times 10^{-1})$ g	
Mass –			
OIML Classes M2	100 mg 200 mg 500 mg	0.095 mg 0.15 mg 0.15 mg	PC-008 procedure for the calibration of weights of accuracy class M1-2, M2, M2-3 & M3 of the NMP 004:2007. INACAL. First Edition-April 2021
OIML Classes M2 & M3	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.29 mg 0.78 mg 0.78 mg 0.80 mg 0.80 mg 0.80 mg 0.83 mg 1.1 mg 3.3 mg 68 mg 50 mg 50 mg 0.43 g 0.55 g	
Pressure –			
Barometers & Meteorological Stations	(800 to 1100) mbar	0.52 mbar	PC-024 calibration of measurement instruments-absolute pressure. First edition 2018. INACAL
Liquid Column Manometer	(0.0 to 55) inH_2O	0.33 inH2O	ME-021 procedure for the calibration of liquid columns (manometric & barometric). Digital edition 2, 2020. CEM-Spain.

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Pressure Gauges, Vacuum Gauges & Manovacuometers[3]	(-0.9 to 0) bar (0 to 700) bar	0.18 bar 0.85 bar	ME-003 procedure for the calibration of pressure gauges, vacuum gauges & manovacuometers ed. digital 3 CEM – SPAIN
Air Velocity – Anemometers	(0.5 to 5) m/s (5 to 10) m/s 10 to 15) m/s (15 to 20) m/s (20 to 25) m/s	0.46 m/s 0.68 m/s 0.9 m/s 1.1 m/s 1.3 m/s	MVAL-LAB-6 procedure for anemometer calibration, ALAB

VII. Optical Quantities

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Spectrophotometers[3] –			
Wavelength	279.35 nm 360.85 nm 453.60 nm 536.45 nm 637.65 nm	0.21 nm 0.21 nm 0.21 nm 0.21 nm 0.21 nm	MVAL-LAB-18 procedure for the calibration of spectrophotometer UV-Vis. rev. 00:2021 ALAB
Absorbance	440 nm 0.2662 A 0.5284 A 1.0809 A 465 nm 0.2410 A 0.4859 A 1.0013 A 546.1 nm 0.2524 A 0.5005 A 1.0141 A 590 nm 0.2880 A 0.5579 A 1.0855 A 635 nm 0.2918 A 0.5547 A 1.0511 A	 0.0025 A 0.0029 A 0.0068 A 0.0025 A 0.0029 A 0.0068 A 0.0025 A 0.0029 A 0.0035 A 0.0025 A 0.0035 A 0.0069 A 0.0025 A 0.0035 A 0.0069 A	

VIII. Thermodynamics

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Thermostatic Baths (Alcohol, Water or Oil as Thermostatic Medium)[3]	(-60 to 200) °C	0.051 °C	PC-019 procedure for the calibration of thermostatic baths. First edition 2019. INDECOPI/SNM (validated)
Temperature[3] – Incubators, Stoves, Ovens, Environmental Chambers, Refrigerators, Freezers & Similar Equipment	(-60 to 250) °C (200 to 1000) °C	0.037 °C 0.17 °C	PC-018 procedure for the calibration or characterization of isothermal media with air as a thermostatic medium. Second edition 2009. INDECOPI/SNM (validated)
Temperature[3] – Heating Plate	(150 to 200) °C (200 to 300) °C (300 to 400) ºC	0.23 °C 1.2 °C 6.7 °C	MVAL-LAB-15 procedure for the calibration temperature plate, ALAB
Temperature[3] – Digester	(0 to 100) °C (100 to 250) °C	0.19 °C 0.22 °C	MVAL-LAB-16 digester calibration procedure, ALAB
Temperature[3] – Autoclave	(100 to 180) °C	0.2 °C	PC-006 procedure for the calibration of autoclaves. Second edition 2008. INDECOPI
Thermometers – Analog Digital	 (-60 to 250) °C (-60 to 250) °C (200 to 1000) °C	 0.12 °C 0.058 °C 3.9 °C	MVAL-LAB-5 procedure for the calibration of analog thermometer PC-017 procedure for calibration of digital thermometers. Second edition 2012. INDECOPI
IR Thermometers	(50 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 320) °C	2.5 °C 3.1 °C 3.4 °C 3.7 °C	Procedure TH-002 for the calibration of infrared radiation thermometers. Digital edition 1. CEM-Spain

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Thermohygrometer – Temperature Function – Sensor Probe	(-30 to 200) °C	0.12 °C	PC-017 procedure for calibration of digital thermometers. Second edition 2012. INDECOPI
Hygrometers & Environmental Thermometers – Temperature Function Sensor In Humidity Function	(10 to 40) °C (20 to 90) % RH	0.48 °C 2.2 % RH	PC-026 procedure for the calibration of hygrometers & environmental thermometers. First edition 2019. INACAL
Liquid In Glass Thermometers (Partial, Total & Complete Immersion)	(-60 to 20) °C (20 to 90) °C (80 to 250) °C	0.06 °C 0.07 °C 0.08 °C	Procedure TH-004 for calibration by comparison of liquid column thermometers

IX. Time & Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Chronometer	1 s to 10 min >10 min to 3 h (>3 to 9) h	0.081 s 0.082 s 0.088 s	MVAL-LAB-7 procedure for calibrating time counters
Non-Contact Tachometers	(10 to 50) rpm (50 to 100) rpm (100 to 500) rpm (500 to 1000) rpm (1000 to 5000) rpm (5000 to 10 000) rpm (10 000 to 50 000) rpm (50 000 to 99 000) rpm	0.013 rpm 0.061 rpm 0.13 rpm 0.61 rpm 1.1 rpm 1.9 rpm 6.3 rpm 12 rpm	MVAL-LAB-8 calibration procedure for tachometer witch optical sensor

[1] This laboratory offers commercial calibration service and field calibration services.

[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 Generate. 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 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] CMCs for intermediate values are calculated using linear interpolation.

[5] The contributions from the "best existing device" are not included in the CMC claim.

[6] In the statement of CMC, percentages are percentages of reading, unless otherwise indicated.

[7] The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.