



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

CENTRO DE METROLOGIA, CALIBRACION Y CAPACITACION INTEGRAL S.A. DE C.V.
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CALIBRATION

Valid to: June 30, 2020

Certificate Number: 4047.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,8}:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
Conductivity Meter	200 000 µS/cm	1500 µS/cm	Certified reference solution
pH Meter	4 pH 7 pH 10 pH	0.011 pH 0.011 pH 0.011 pH	Certified reference solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Caliper ³	Up to 10 in	380 µin	Gage blocks
Outside Micrometer ³	Up to 10 in	(10 + 14L) µin	Gage blocks
Height Gage	Up to 10 in	(100 + 6.9L) µin	Gage blocks

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Dial Gage	Up to 2 in	210 μin	Gage blocks
Angle – Protractors ³	(0 to 90)°	0.02°	Angle block
Gauge Block	(0.05 to 1) in 2 in 3 in 4 in	(1.9 + 4.8L) μin 13 μin 18 μin 23 μin	Block comparator and gage block
Optical Comparators and Vision Systems ³ – X-Y Linear Distance Angle	Up to 12 in (0 to 45)°	110 μin 0.2°	Gage blocks and glass reticule/scale Angle gage block
Outside Diameter – Cylindrical Plug Gages	Up to 30 mm	(1.2 + 0.04L) μm	Reference cylindrical standards and laser micrometer as comparator
Feeler Gage	(0.0015 to 1) in	84 μin	Micrometer

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate ³	Up to 320 mV (0.320 01 to 3.2) V (3.2001 to 32) V (32.001 to 320) V (320.01 to 1050) V	28 μV 290 μV 2.9 mV 30 mV 99 mV	Wavetek 9100

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Current – Generate ³	Up to 320 µA (0.320 01 to 3.2) mA (3.2001 to 32) mA (32.001 to 320) mA (0.320 01 to 3.2) A (3.2001 to 10.5) A (10.5001 to 20) A	83 nA 0.63 µA 6.4 µA 72 µA 2.4 mA 7.6 mA 19 mA	Wavetek 9100

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³			
Up to 10 mV	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.045 % 0.60 mV 1.2 mV 2.3 mV 6.0 mV	Wavetek 9100
(10.001 to 32) mV	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.013 % 0.017 % 0.030 % 0.059 % 1.6 mV	
(32.001 to 320) mV	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.018 % 0.018 % 0.028 % 0.045 % 1.1 mV	
(0.32001 to 3.2) V	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	1.8 mV 1.8 mV 2.8 mV 4.5 mV 11 mV	
(3.2001 to 32) V	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	18 mV 26 mV 36 mV 67 mV 0.17 V	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(32.0001 to 105) V	10 Hz to 3 kHz (3 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	58 mV 83 mV 0.12 V 0.22 V 0.55 V	Wavetek 9100
(105.0001 to 320) V	(40 to 100) Hz 100 Hz to 1 kHz (1 to 3) kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	0.21 V 0.21 V 0.32 V 0.34 V 0.50 V 0.63 V	
(320.01 to 800.00) V	(40 to 100) Hz 100 Hz to 1 kHz (1 to 3) kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	0.54 V 0.54 V 0.82 V 0.87 V 1.3 V 2.0 V	
(800.01 to 1050) V	(40 to 100) Hz 100 Hz to 1 kHz (1 to 3) kHz (3 to 10) kHz (10 to 20) kHz	0.61 V 0.61 V 0.89 V 0.99 V 1.8 V	
AC Current – Generate ³			
(0 to 32) μA	10 Hz to 3 kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	1.1 μA 2.2 μA 7.1 μA 11 μA	Wavetek 9100
(32.001 to 320) μA	10 Hz to 3 kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	0.63 μA 1.1 μA 3.1 μA 4.4 μA	
(0.32001 to 3.2) mA	10 Hz to 3 kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	3.0 μA 4.5 μA 9.8 μA 13 μA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate ³ (cont)			
(3.2001 to 32) mA	10 Hz to 3 kHz (3 to 10) kHz (10 to 3) kHz (20 to 30) kHz	30 µA 45 µA 89 µA 0.15 mA	Wavetek 9100
(32.001 to 320) mA	10 Hz to 3 kHz (3 to 10) kHz (10 to 20) kHz (20 to 30) kHz	0.34 mA 0.43 mA 0.82 mA 1.1 mA	
(0.32001 to 3.2) A	10 Hz to 3 kHz (3 to 10) kHz	0.16 mA 13 mA	
(3.2001 to 10.5) A	10 Hz to 3 kHz (3 to 10) kHz	31 mA 74 mA	
(10.5001 to 20) A	10 Hz to 3 kHz (3 to 10) kHz	56 mA 0.15 A	
Inductance ³ –			
(100 to 1000) µH (1 to 10) mH (10 to 100) mH (100 to 1000) mH (1 to 10) H	1 kHz	0.12 % 0.12 % 0.12 % 0.12 % 0.12 %	Decade inductor
Capacitance ³ –			
(1 to 10) pF (10 to 100) pF (100 to 1000) pF (1000 to 10 000) pF (0.01 to 0.1) µF (0.1 to 1) µF	1 kHz	0.092 % 0.10 % 0.10 % 0.10 % 0.11 % 0.095 %	Decade precision

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Resistance – Generate ³	(10 to 40) Ω (40.001 to 400) Ω (0.400 01 to 4) kΩ (4.0001 to 40) kΩ (40.001 to 400) kΩ (0.400 01 to 4) MΩ (4.0001 to 40) MΩ (40.001 to 400) MΩ	24 mΩ 93 mΩ 0.79 Ω 8 Ω 93 Ω 1.1 kΩ 35 kΩ 0.33 MΩ	Wavetek 9100
Electrical Simulation of Thermocouples and Temperature Indicators ³ –			
Type B	(500 to 800) °C (800 to 1000) °C (1000 to 1400) °C (1400 to 1820) °C	0.61 °C 0.49 °C 0.43 °C 0.45 °C	Wavetek 9100 without cold junction compensation
Type C	(0 to 600) °C (600 to 1000) °C (1000 to 1800) °C (1800.0 to 2320) °C	0.40 °C 0.38 °C 0.49 °C 0.49 °C	
Type E	(-250.0 to -200.0) °C (-200.0 to -100.0) °C (-100.0 to 100.0) °C (100.0 to 1000.0) °C	0.52 °C 0.34 °C 0.31 °C 0.34 °C	
Type J	(-210.0 to -100.0) °C (-100.0 to 800.0) °C (800.0 to 1000.0) °C (1000.0 to 1200.0) °C	0.36 °C 0.32 °C 0.33 °C 0.34 °C	
Type K	(-250.0 to -200.0) °C (-200.0 to -100.0) °C (-100.0 to 100.0) °C (100.0 to 600.0) °C (600.0 to 1372.0) °C	0.63 °C 0.37 °C 0.32 °C 0.34 °C 0.37 °C	
Type L	(-200.0 to -50.0) °C (-50.0 to 200.0) °C (200.0 to 700.0) °C (700.0 to 900.0) °C	0.36 °C 0.31 °C 0.32 °C 0.34 °C	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation of Thermocouples and Temperature Indicators ³ – (cont)			
Type N	(-200.0 to -100.0) °C (-100.0 to 900.0) °C (900.0 to 1100.0) °C (1100.0 to 1300.0) °C	0.42 °C 0.34 °C 0.33 °C 0.35 °C	Wavetek 9100 without cold junction compensation
Type R	(0.0 to 100.0) °C (100.0 to 200.0) °C (200.0 to 1600.0) °C (1600.0 to 1767.0) °C	0.59 °C 0.49 °C 0.45 °C 0.39 °C	
Type S	(0.0 to 200.0) °C (200.0 to 1000.0) °C (1000.0 to 1400.0) °C (1400.0 to 1767.0) °C	0.55 °C 0.45 °C 0.43 °C 0.44 °C	
Type T	(-250.0 to -200.0) °C (-200.0 to -100.0) °C (-100.0 to 0.0) °C (0.0 to 400.0) °C	0.44 °C 0.39 °C 0.36 °C 0.33 °C	
Electrical Simulation of RTD Indicating Devices Resistance ³ –			
Pt 385	(-200.0 to -100.0) °C (-100.0 to 100.0) °C (100.0 to 630.0) °C (630.0 to 850.0) °C	0.16 °C 0.11 °C 0.21 °C 0.31 °C	Wavetek 9100A
Pt 392	(-200.0 to -100.0) °C (-100.0 to 100.0) °C (100.0 to 630.0) °C	0.16 °C 0.11 °C 0.21 °C	
DC Voltage – Measure ³	Up to 100 mV (0.1000 01 to 1) V (1.000 01 to 10) V (10.0001 to 100) V (100.001 to 1000) V	13 µV 58 µV 210 µV 5.2 mV 56 mV	Agilent 34401A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Resistance – Measure ³	(10 to 100) Ω (0.100 001 to 1) kΩ (1.000 01 to 10) kΩ (10.0001 to 100) kΩ (0.1000 01 to 1) MΩ (1.000 01 to 10) MΩ (10.0001 to 100) MΩ	80 mΩ 170 mΩ 1.7 Ω 18 Ω 170 Ω 6.4 kΩ 1.5 MΩ	Agilent 34401A
DC Current – Measure ³	Up to 10 mA (10.0001 to 100) mA (0.1 to 1) A (1.000 001 to 3) A (3.01 to 10) A	11 μA 85 μA 1.7 mA 6.5 mA 6.5 mA	Agilent 34401A Fluke 289
DC High Voltage – Measure ³	(0 to 6) kV	(0.6 + 0.0120/V) V	Fluke 289/Fluke 80K-6

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC High Voltage – Measure ³ (0 to 6) kV	 (50 to 60) Hz	 (0.6 + 0.0120/V) V	 Fluke 289/Fluke 80K-6
AC Voltage – Measure ³ (Up to 100) mV (0.100 001 to 1) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 50 kHz (50 to 100) kHz (100 to 300) kHz Up to 10 Hz (10 to 60) Hz 60 Hz to 1 kHz (1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	1.2 mV 5500 μV 300 μV 1.1 mV 5.6 mV 4.4 mV 1.1 mV 1.1 mV 1.1 mV 2.1 mV 3.9 mV	Agilent 34401A

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Measure ³ (cont)			
(1.000 001 to 10) V	Up to 10 Hz (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	13 mV 13 mV 13 mV 13 mV	Agilent 34401A
(10.000 01 to 100) V	Up to 10 Hz (10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	70 mV 70 mV 70 mV 70 mV	
(100.0001 to 750) V	Up to 45 Hz 45 Hz to 60 Hz 60 Hz to 1 kHz	0.78 V 0.78 V 0.78 V	
AC Current – Measure ³			
Up to 1 A	(5 to 10) Hz 10 Hz to 5 kHz	3.1 mA 2.9 mA	Agilent 34401A
(1.000 01 to 3) A	(5 to 10) Hz 10 Hz to 5 kHz	12 mA 12 mA	
(3.01 to 10) A	45 Hz to 1 kHz	12mA	Fluke 289

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Kinematic Viscosity – Measuring Equipment	19 cSt 120 cSt 450 cSt 880 cSt	0.24 cSt 1.3 cSt 4.8 cSt 9.2 cSt	Certified reference viscosity solutions



V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Force ³ – Measuring Equipment			
Tension and Compression	Up to 5 lbf 5 to 50 lbf 50 to 95 lbf (10 to 500) lbf	0.000 92 lbf 0.013 lbf 0.017 lbf 0.6 lbf	NIST Class F weights Omega load cell
Pneumatic Pressure Gages ³ –	Up to -12 psig (Up to 300) psig (300 to 500) psig	0.019 0.033 psig 0.09 psig	Druck DPI 610 IS Fluke 700G07
Pressure With Oil or Distilled Water ³	(500 to 6000) psig (6000 to 10 000) psig	6.1 psig 6.2 psig	Digital pressure gauge and hydraulic hand pump
Torque Tools ³	Up to 100 in·lbf	0.96 %	Torque transducer
Torque Analyzer ³	Up to 5 lbf-in (5 to 12.5) lbf-in (12.5 to 75) lbf-in (75 to 100) lbf-in (100 to 200) lbf-in (200 to 450) lbf-in	0.058 % 0.036 % 0.031 % 0.018 % 0.031 % 0.14 lbf-in	Dead weight and CDI calibration wheel
Indirect Verification of Rockwell Hardness Testers ³	HRC: Low Medium High	0.39 HRC 0.44 HRC 0.53 HRC	Indirect verification per ASTM E18
Weighing Instruments ³	(20 to 200) g (300 to 600) g (700 to 1000) g (1200 to 2000) g (2500 to 5000) g (5 to 20) kg (20 to 30) kg (30 to 50) kg (60 to 100) kg (100 to 200) kg	11 mg 13 mg 14 mg 17 mg 84 mg 0.17 g 2.0 g 3.4 g 6.3 g 0.0063 %	Class F1 weights Class M1 weights

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Weighing Instruments ³ (cont)	(200 to 300) kg (300 to 600) kg	0.008 % 0.13 kg	Class M1 weights
Mass – Measure Class M1 M2 M3 Class M3	5 kg 10 kg 20 kg 1 kg 2 kg 1 lb 5 lb 10 lb 20 lb 50 lb	59 mg 89 mg 0.34 g 6.1 mg 6.7 mg 24 mg 77 mg 0.17 g 0.31 g 0.71 g	Balance and weight
Durometers ³ – Type A, B, C, D, DO, E, M, O, OO, OOO, OOO-S, and R Spring Calibration Force Only	Up to 10 N Up to 50 N	0.017 N 0.36 N	ASTM D2240 Load cell
Linear Surface Speed ³ – Measure	(0.1 to 1) m/min (1 to 10) m/min (10 to 25) m/min (25 to 50) m/min (50 to 100) m/min	0.064 m/min 0.015 m/min 0.32 m/min 0.61 m/min 1.2 m/min	Extech tachometer
Tachometers and RPM Measurements ³	(1 to 100) rpm (100 to 500) rpm (500 to 1000) rpm (1000 to 2500) rpm (2500 to 5000) rpm (5000 to 10 000) rpm	0.21 rpm 0.43 rpm 0.71 rpm 1.7 rpm 3.1 rpm 6.0 rpm	Extech tachometer

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Thermometers ³ – Digital and Mechanical (Dial)	(50 to 580) °C	0.26 °C	Ametek 601 temperature calibrator
Temperature – Measure ³	(-40 to 450) °C	0.39 °C	Extech PT392 RTD thermometer
Relative Humidity – Measuring Equipment	20 % RH 50 % RH 75 % RH	1.4 % RH 1.4 % RH 1.4 % RH	Traceable hygrometer and salt solutions
Relative Humidity – Measure ³	(20 to 75) % RH	1.4 % RH	Traceable hygrometer

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6,7} (±)	Comments
Frequency – Measuring Equipment ³	0.5 Hz to 10 MHz	280 mHz	Wavetek 9100
Frequency – Measure ³	(3 to 100) Hz 100 Hz to 1 MHz (1 to 100) MHz 100 MHz to 1 GHz (1 to 18) GHz	0.25 mHz 200 mHz 1.8 Hz 1.2 kHz 1.5 kHz	Agilent 34401A and HP 5350B
Stopwatches and Timers ³	(1 to 600) s	2 ms + 0.012 %	Tektronix TDS 2012

¹ This laboratory offers commercial calibration service and field 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 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 and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. 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 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 percent or fraction of the reading plus a fixed floor specification.
- ⁵ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches.
- ⁶ In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.
- ⁷ 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.
- ⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.





Accredited Laboratory

A2LA has accredited

CENTRO DE METROLOGÍA, CALIBRACION Y CAPACITACION INTEGRAL S.A DE C.V DBA QUANT

Cd. Juarez, Chihuahua, MEXICO

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).



Presented this 27th day of December 2018.

A handwritten signature in blue ink, positioned above a horizontal line.

Senior Director, Accreditation Services
For the Accreditation Council
Certificate Number 4047.01
Valid to June 30, 2020

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