SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: February 29, 2024 Certificate Number: 2398.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 7]:

I. Chemical

Parameter/Equipment	Range	CMC[2] (±)	Comments
pH Meters[3]	4 to 10 pH	0.02 pH	Buffer solutions
Conductivity Meters[3]	1 µS 10 µS 100 µS	0.7 µS 0.7 µS 2.4 µS	Conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Calipers[3]	Up to 6 in (6 to 12) in (12 to 20) in (20 to 30) in (30 to 40) in	95 µin 160 µin 240 µin 550 µin 480 µin	Gage blocks, gage block adapter, surface plate
Dial Indicators[3]	Up to 1 in	19 µin	Gage blocks, micrometer head

Parameter/Equipment	Range	CMC[2] (±)	Comments
Test Indicators[3]	Up to 1 in	63 µin	Gage blocks
Gage Blocks	(0.05 to 0.4) in (0.4 to 0.6) in (0.6 to 0.8) in (0.8 to 1) in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 8) in (8 to 10) in (10 to 12) in	8.6 µin 10 µin 12 µin 14 µin 26 µin 37 µin 49 µin 62 µin 73 µin 97 µin 120 µin 140 µin	Gage blocks, comparator Lab Master
Height Gages[3]	(0.1 to 1) in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 7) in (7 to 8) in (8 to 10) in (10 to 12) in (12 to 16) in (16 to 20) in (20 to 30) in (30 to 40) in	60 µin 64 µin 69 µin 76 µin 85 µin 94 µin 100 µin 110 µin 140 µin 160 µin 200 µin 250 µin 370 µin 490 µin	Gage blocks, surface plate
Micrometers[3]	(0.1 to 0.5) in (0.5 to 1) in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 7) in (7 to 8) in (8 to 10) in (10 to 12) in	15 µin 19 µin 28 µin 39 µin 50 µin 63 µin 74 µin 86 µin 97 µin 120 µin 140 µin	Gage blocks, surface plate
Rulers & Tape Measures	Up to 25 ft	0.020 in	Gage blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Optical Comparators[3] –			
X & Y	Up to 5 in 6 to 12 in	93 µin 200 µin	Glass standard
Microscopes[3] –			
X & Y	Up to 1 in	54 µin	Stage micrometer

III. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate			Transmille 4010
(0 to 202) mV	(10 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 500) kHz	0.085 % + 15 µV 0.017 % + 15 µV 0.021 % + 28 µV 0.11 % + 40 µV 0.42 % + 100 µV	
(0.2 to 2.02) V	(10 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1 MHz	0.053 % + 180 µV 0.017 % + 120 µV 0.022 % + 180 µV 0.069 % + 300 µV 0.32 % + 450 µV	
(2 to 20.2) V	(10 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz	0.053 % + 1600 µV 0.017 % + 1000 µV 0.022 % + 1600 µV 0.32 % + 3000 µV	
(20 to 202) V	(30 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 40) kHz (40 to 100) kHz	0.053 % + 20 mV 0.016 % + 12 mV 0.021 % + 16 mV 0.032 % + 30 mV 0.211 % + 50 mV	
(200 to 1020) V	(30 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.058 % + 200 mV 0.021 % + 60 mV 0.026 % + 120 mV 0.032 % + 200 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Measure			Transmille 8104
Up to 100 mV	(10 to 40) Hz (40 to 200) Hz 200 Hz to 1 kHz (1 to 2) kHz (2 to 20) kHz (20 to 100) kHz	0.5 % + 17 µV 0.2 % + 10 µV 0.2 % + 9.2 µV 0.2 % + 9.2 µV 0.3 % + 12 µV 0.6 % + 58 µV	
100 mV to 1V	(10 to 40) Hz (40 to 200) Hz 200 Hz to 1 kHz (1 to 2) kHz (2 to 20) kHz (20 to 100) kHz 100 kHz to 1 MHz	0.04 % + 170 µV 0.02 % + 69 µV 0.02 % + 69 µV 0.02 % + 69 µV 0.03 % + 120 µV 0.06 % + 580 µV 1.1 % + 29 µV	
AC Voltage – Measure			Transmille 8104
(1 to 10) V	(10 to 40) Hz (40 to 200) Hz 200 Hz to 1 kHz (1 to 2) kHz (2 to 20) kHz (20 to 100) kHz	0.04 % + 1.7 mV 0.02 % + 0.7 mV 0.02 % + 0.7 mV 0.02 % + 0.7 mV 0.03 % + 1.2 mV 0.06 % + 5.8 mV	
(10 to 100) V	(10 to 40) Hz (40 to 200) Hz 200 Hz to 1 kHz (1 to 2) kHz (2 to 20) kHz (20 to 0) kHz	0.05 % + 17 mV 0.02 % + 10 mV 0.02 % + 8.1 mV 0.02 % + 8.1 mV 0.03 % + 11 mV 0.08 % + 58 mV	
(100 to 1000) V	(10 to 40) Hz (0.4 to 1) kHz (1 to 10) kHz	0.05 % + 170 mV 0.02 % + 100 mV 0.03 % + 120 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate			Transmille 4010
20 to 202) µA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.21 % + 0.25 µA 0.074 % + 0.15 µA 0.85 % + 0.25 µA 1.7 % + 0.4 µA	
(0.2 to 2.02) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.21 % + 0.25 µA 0.063 % + 0.2 µA 0.53 % + 0.3 µA 1.1 % + 0.6 µA	
(2 to 20.2) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.21 % + 3 µA 0.042 % + 2 µA 0.26 % + 3 µA 0.53 % + 4 µA	
(20 to 202) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.21 % + 30 µA 0.042 % + 20 µA 0.53 % + 40 µA 0.74 % + 200 µA	
(0.2 to 2.02) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.21 % + 300 µA 0.063 % + 200 µA 0.53 % + 400 µA 0.63 % + 1000 µA 2.6 % + 5000 µA	
(2 to 30) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.21 % + 3000 µA 0.085 % + 2000 µA 0.32 % + 4000 µA 0.63 % + 4000 µA 3.2 % + 5000 µA	
AC Current – Measure			Transmille 8104
Up to 100 µA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	0.1 % + 17 nA 0.05 % + 14 nA 0.13 % + 34.64 nA	
(0.1 to 1) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	0.1 % + 170 nA 0.05 % + 140 nA 0.13 % + 350 nA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Measure (Cont)			Transmille 8104
(1 to 10) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	0.1 % + 1.7 µA 0.05 % + 1.4 µA 0.13 % + 3.46 µA	
(10 to 100) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	0.1 % + 17 µA 0.05 % + 14 µA 0.13 % + 35 µA	
(0.1 to 1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz	0.12 % + 230 µA 0.07 % + 170 µA 0.14 % + 580 µA	
(1 to 10) A	(10 to 45) Hz 45 Hz to 1 kHz	0.17 % + 4.6 mA 0.13 % + 3.5 µA	
(10 to 30) A	(10 to 45) Hz 45 Hz to 1 kHz	0.17 % + 14 mA 0.13 % + 10 µA	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Voltage – Generate	(0 to 202) mV (0.2 to 2.02) V (2 to 20.2) V (20 to 202) V (200 to 1025) V	16 µV/V + 0.2 µV/V 9.5 µV/V + 2.5 µV/V 8.5 µV/V + 24 µV/V 13 µV/V + 240 µV/V 13 µV/V + 2400 µV/V	Transmille 4010
DC Voltage – Measure	(0.01 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	9.5 µV/V + 0.2 µV 6.8 µV/V + 0.7 µV 7.2 µV/V + 6.9 µV 10 µV/V + 92 µV 10 µV/V + 1.4 mV	Transmille 8104
DC Current – Generate	(0 to 202) µA (0.2 to 2.02) mA (2 to 20.2) mA (20 to 202) mA (0.2 to 2.02) A (2 to 20.2) A (20.2 to 30) A	0.011 % + 0.01 µA 0.0053 % + 0.03 µA 0.0053 % + 0.2 µA 0.0053 % + 2 µA 0.014 % + 30 µA 0.032 % + 300 µA 0.053 % + 450 µA	Transmille 4010

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Resistance – Generate	0 Ω 0.1 Ω 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1000 MΩ (0 to 100) Ω (100 to 330) Ω 330 Ω to 1 kΩ (1 to 3.3) kΩ	0 Ω + 0.005 Ω 0.0028 % + 0.005 Ω 0.0026 % + 0.005 Ω 0.0026 % + 0.005 Ω 0.0019 % + 0.005 Ω 0.0019 % + 0.005 Ω 0.0008 % + 0.05 Ω 0.0019 % + 0.5 Ω 0.0026 % + 5 Ω 0.0095 % + 100 Ω 0.19 % + 200 Ω 0.011 % + 3000 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω	Transmille 4010 – passive standard resistor 4-wire 2- wire
Simulated Resistance	(3.3 to 10) kΩ (10 to 33) kΩ (33 to 100) kΩ (100 to 330) kΩ 330 kΩ to 1 MΩ (1 to 3.3) MΩ (3.3 to 10) MΩ (10 to 33) MΩ (33 to 100) MΩ (110 to 330) MΩ 330 MΩ to 1 GΩ	0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 0.05 Ω 0.013 % + 50 Ω 0.013 % + 2500 Ω 0.053 % + 100 000 Ω 1.1 % + 100 000 Ω 2.1 % + 500 000 Ω	Transmille 4010 – Simulated
Resistance - Measure	1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 100 kΩ 1 MΩ 10 MΩ	25 μΩ/Ω + 6.9 μΩ 17 μΩ/Ω + 35 μΩ 15 μΩ/Ω + 120 μΩ 13 μΩ/Ω + 0.92 mΩ 16 μΩ/Ω + 9.2 mΩ 16 μΩ/Ω + 92 mΩ 16 μΩ/Ω + 6.9 Ω 19 μΩ/Ω + 2.3 Ω 27 μΩ/Ω + 92 Ω	Transmille 8104 4-wire 2-wire

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Capacitance – Generate @ 1 kHz	1 nF 2 nF 5 nF 10 nF 100 nF 1 µF 10 µF (0.95 to 9.5) µF (9.5 to 95) µF 95 µF to 0.95 mF (0.95 to 9.5) mF (9.5 to 100) mF	0.26 % 0.26 % 0.26 % 0.26 % 0.26 % 0.42 % 0.63 % 0.74 % 0.74 % 0.74 % 0.74 % 0.74 %	Transmille 4010 - simulated
Inductance – Generate @ 1 kHz	1 mH 10 mH 19 mH 29 mH 50 mH 100 mH 1 H 10 H	0.54 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH 0.53 % + 50 µH	Transmille 4010

Parameter/Equipment	Range	CMC[2, 6] (±)	Comment
Electrical Simulation of Thermocouples[3] – Generate/Measure			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.82 °C 0.73 °C 0.62 °C 0.63 °C	Transmille EA001A
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.58 °C 0.22 °C 0.22 °C 0.24 °C 0.25 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.32 °C 0.23 °C 0.22 °C 0.24 °C 0.28 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1370) °C	0.35 °C 0.25 °C 0.23 °C 0.29 °C 0.34 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.5 °C 0.29 °C 0.26 °C 0.25 °C 0.33 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1760) °C	0.89 °C 0.52 °C 0.59 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1760) °C	0.89 °C 0.52 °C 0.59 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.68 °C 0.22 °C 0.22 °C 0.23 °C	

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Electrical Simulation of RTDs[3] –			
PT100 PRT	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (630 to 800) °C	0.03 °C 0.03 °C 0.05 °C 0.06 °C 0.08 °C 0.16 °C	Transmille EA001A
Pressure - Measure and Measuring Equipment	(-0.5 to 0.5) in H_2O (-25 to 25) mbar (-0.95 to 1) bar (1 to 2.5) bar (2.5 to 40) bar (-13.5 to 300) psi (300 to 3000) psi (3000 to 10 000) psi	0.0013 in H_2O 0.031 mbar 0.0005 bar 0.0009 bar 0.011 bar 0.081 psi 1.9 psi 2.7 psi	Handheld pressure calibrator 10000 psi pressure gauge
Torque Measure - Wrenches	(4 to 50) lbf·in (50 to 500) lbf·in (25 to 250) lbf·ft (250 to 750) lbf·ft (750 to 2000) lbf·ft	0.38 % 0.78 % 0.63 % 0.67 % 0.72 %	AWS torque transducers
Pipettes	(1 to 200) µL (200 to 500) µL 500 µL to 2 mL (2 to 5) mL (5 to 10) mL (10 to 20) mL (20 to 50) mL (50 to 100) mL (100 to 200) mL	0.36 µL 0.35 µL 0.4 µL 1 µL 2 µL 4 µL 10 µL 20 µL 40 µL	Ohaus balances – gravimetric method

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Mass – Measure	(1 to 20) mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg 500 mg to 1 g (1 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g	0.006 mg 0.007 mg 0.008 mg 0.009 mg 0.011 mg 3.1 mg 2.7 mg 0.13 mg 0.15 mg 0.27 mg 0.51 mg 0.99 g	OIML Class E1 ASTM Class 1
Balances & Scales[3]	(1 to 20) mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg 500 mg to 1 g (1 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g (200 to 1000) g (1000 to 2000) g (2000 to 5000) g (5000 to 10 000) g (10 000 to 20 000) g (20 000 to 30 000) g (30 000 to 40 000) g (40 000 to 50 000) g	0.004 mg 0.005 mg 0.006 mg 0.007 mg 0.01 mg 3.1 mg 2.7 mg 0.06 mg 0.1 mg 0.25 mg 0.49 mg 0.99 mg 0.005 g 0.01 g 0.12 g 0.049 g 0.1 g 0.15 g 0.2 g 0.25 g	OIML Class E1 ASTM Class 1 Class F

V. Thermodynamic

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Temperature – Measure	(-80 to -25) ºC (-24 to 160) ºC (160 to 300) ºC (300 to 1210) ºC	0.75 °C 0.059 °C 0.22 °C 0.88 °C	Drywell temperature source w/RTD
Relative Humidity – Measuring Equipment Thermohygrometers	 (15 to 90) % RH (90 to 95) % RH	 1.4 % 2.1 %	 Vaisala HMP75
Infrared Thermometer	(-15 to 0) °C (0 to 35) °C (35 to 50) °C (50 to 100) °C (100 to 120) °C (35 to 100) °C (100 to 200) ºC (200 to 350) °C (350 to 500) °C	0.53 °C 1.8 °C 0.88 °C 1.1 °C 1.1 °C 0.73 °C 2.0 °C 2.3 °C 2.1 °C	Fluke 4180 Fluke 4181 Emissivity 0.95 wavelength (8 to 14) µm

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Frequency – Generate	1 Hz to 1 MHz 10 MHz	1.38 µHz/Hz + 0.577 Hz 1.38 µHz/Hz + 0.577 Hz	Transmille 4010
Frequency – Measure	(1 to 100) Hz 100 Hz to 1 kHz (1 to 10) kHz 10 kHz to 1 MHz	2.261 µHz/Hz + 17.321 µHz 2.252 µHz/Hz + 173.205 µHz 2.252 µHz/Hz + 1.732 mHz 2.252 µHz/Hz + 1.732 Hz	Multimeter

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Stopwatch & Timers	Up to 19.99 s/day	0.033 s/day	Helmut Klein timometer

[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. 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 of 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, percentages are percentage of reading, unless otherwise indicated; L is the numerical value of the nominal length of the device measured in inches

[6] 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.

[7] This scope meets A2LA's *P112 Flexible Scope Policy*.

Accredited Laboratory

A2LA has accredited

LAW CALIBRATION, LLC

Saco, ME

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 requirements of ANSI/NCSL Z540-1-1994 and 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 October 2022.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2398.01
Valid to February 29, 2024

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