SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: November 30, 2026 Certificate Number: 1741.02

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory at the location listed above to perform the following calibrations[1, 10]:

I. Acoustical Quantities

Parameter/Range	Frequency	CMC[2, 9] (±)	Comments
Sound – Measuring Equipment			
114 dB	(125 to 2000) Hz 4000 Hz	0.35 dB 0.63 dB	Genrad 1986 Omni Cal sound level calibrator
104 dB	(125 to 2000) Hz 4000 Hz	0.46 dB 0.74 dB	
94 dB	(125 to 2000) Hz 4000 Hz	0.46 dB 0.74 dB	
84 dB	(125 to 2000) Hz 4000 Hz	0.46 dB 0.74 dB	
74 dB	(125 to 2000) Hz 4000 Hz	0.46 dB 0.74 dB	

II. Chemical

Parameter/Equipment	Range	CMC[2] (±)	Comments
pH Meters[3]	4 pH 7 pH 10 pH	0.027 pH 0.027 pH 0.027 pH	Standard pH solutions

III. Dimensional

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Angle Plates, Parallels & Squares	Up to 18 in	(43 + 5.3*L*) µin	Tri square & Mahr Supramess
Bore Gages – (Hole Mic, Tri Mics)	Up to 8 in	(23 + 11*L*) µin + 0.6*R*	Ring gages
Calipers[3]	Up to 40 in (40 to 60) in	(6.9 + 2.8*L*) µin + 0.6*R* (290 + 6.4*L*) µin + 0.6*R*	Gage blocks Micrometer standards
Caliper Master	Up to 12 in	(7.8 + 1.8*L*) µin	P&W Labmaster™
Feeler Gages[3]	Up to 1 in	75 µin	Fowler mini-horizontal
Cylindrical Measure – Plain Rings Pins, Plain Plugs, Discs, Spheres – External Diameter	 Up to 14 in Up to 13 in	 (7.8 + 1.8*L*) µin (7.8 + 1.8*L*) µin	 P&W Labmaster™
Combination Squares/Protractors/Angle Gages	Up to 180°	0.16°	Optical comparator

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Gage Blocks	Up to 4 in (4 to 20) in	(3.7 + 1.0*L*) µin (3.7 + 2.3*L*) µin	Federal gage block comparator Federal 130B-16 long block comparator
Hand Tools[3] – Depth Gages, Snap Gages, Fixture Gages, Thickness Gages	Up to 40 in	(6.9 + 2.8*L*) µin + 0.6*R*	Gage blocks
Height Gages[3]	Up to 48 in	(6.1 + 2.6*L*) µin + 0.6*R*	Gage blocks, surface plate
Linear Indicators[3], Dial & Test	Up to 0.1 in (0.1 to 0.5) in Up to 4 in Up to 4 in	13 µin + 0.6*R* 61 µin + 0.6*R* (6.7 + 3*L*) µin + 0.6*R* (7.8 + 1.9*L*) µin + 0.6*R*	Federal indicator calibrator Gage blocks P&W Labmaster™
Micrometer Head	Up to 2 in	(6.7 + 3*L*) µin + 0.6*R*	Gage blocks
Micrometer Master	Up to 12 in	(7.8 + 1.8*L*) µin	P&W Labmaster™
Pin Gages[3]	Up to 1 in	75 µin	Bench micrometer
Protractor & Angle Indicators[3]	Up to 60° 0.25°, 0.5°, 1°, 2°, 3°, 4°, 5°, 10°, 15°, 20°, 25°, 30°, 45°, 60°, 90°	0.03° 0.03°	Sine bar & gage blocks Angle block set
Optical Comparator[3] – X-Y Linearity Magnification Angle	 Up to 12 in 10x to 250x (0 to 90)°	 150 µin 0.014 in 0.1°	 Glass master scales Angle block set

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Radius Gages	Up to 2 in	480 µin	Optical comparator
Steel Rules[3]	Up to 72 in Up to 120 in	480 µin (4.8 + 9.2*L*) µin + 0.6*R*	Optical comparator Gage blocks
Micrometers[3] –			
Outside	Up to 40 in (40 to 60) in	(6.9 + 2.8*L*) µin + 0.6*R* (290 + 6.4*L*) µin + 0.6*R*	Gage blocks Micrometer standards
Inside	Up to 4 in Up to 60 in	(9 + 2.7*L*) µin + 0.6*R* (61 + 11*L*) µin + 0.6*R*	Gage blocks w/accessory kit B&S 6′ UltraMic
Micrometer Standards	Up to 60 in	(61 + 11*L*) µin + 0.6*R*	B&S 6′ UltraMic
Tape Measures[3]	Up to 25 ft	(4.8 + 9.2*L*) µin + 0.6*R*	Gage blocks
Thread Plugs –			
Major Diameter Pitch Diameter	Up to 7 in Up to 7 in	(15 + 1.5*L*) µin (98 + 0.2*L*) µin	P&W Labmaster™ universal w/ thread wires
Gage Block Comparators[3] –			
Amplifier Gain Contact Force	0.002 in (0 to 150) g	2.9 µin 4.4 g	Master gage block Force gage
Interim Verification of Coordinate Measuring Machines[3] –			
X, Y, Z Linearity Volumetric Performance	Up to 36 in Up to 10 in	(55 + 3*L*) µin 140 µin	Gage blocks Ball bar

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Surface Plates[3] – Grades AA, A, & B			
Repeatability/Local Flatness	0.002 in	26 µin	Repeat-o-meter
Flatness	Up to 60 *DL* in (> 60 to 120) *DL* in	(31 + 0.2*DL*) µin (30 + 0.3*DL*) µin	Federal level systems
Crimpers[3] –			
Functional Diameter	(0.011 to 0.060) in (0.061 to 0.250) in	260 µin 260 µin	Pin gages
Crimp Pull Force	Up to 50 lb	0.05 %	Test weights
Crimp Handle Force	Up to 100 lb	0.32 lb	Force gauge
Crimp Height	Up 1 in	0.0003 in	Micrometer
Bench Micrometers, Universal Length Measuring Machines[3] –			
Linearity	Up to 20 in	(5.4 + 1.6*L*) µin + 0.6*R*	Gage blocks
Parallelism	Up to 50 µin	5 µin	Reference sphere
Force	Up to 80 oz	0.32 oz	Futek load cell
Linear Encoders[3] – (Displacement Transducers, LVDT's)	Up to 48 in Up to 24 in	(160 + 0.7*L*) µin + 0.6*R* 0.005 % + 0.6*R*	Gage blocks Gage blocks w/ multimeter
Sieve –			
Opening	(0.0047 to 23) mm	4.7 µm	ASTM E11, vision system
Wire Diameter	(0.0047 to 3.6) mm	4.7 µm	

IV. Dimensional Testing/Calibration[1]

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Length[8] –			
X-Axis	Up to 29 in (750 mm)	(230 + 8.4*L*) µin	CMM
Y-Axis	Up to 39 in (1000 mm)	(230 + 8.4*L*) µin	
Z-Axis	Up to 25 in (500 mm)	(230 + 8.4*L*) µin	
Volumetric[3]	39 in (1000 mm)	(510 + 3.2*L*) µin	
X-Y Measurements	(12 x 12) in	(180 + 6.2*L*) µin	Sprint 300
Z-Axis	Up to 4 in	400 µin	
1-D	Up to 43 in	(150 + 4.2*L*) µin	Trimos height gauge

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
DC Voltage – Measure[3]	(0 to 200) mV	5.8 µV/V + 0.1 µV	Fluke 8508A
	200 mV to 2 V	4.7 µV/V + 0.4 µV	
	(2 to 20) V	4.5 µV/V + 4.0 µV	
	(20 to 200) V	6.2 µV/V + 40 µV	
	(200 to 1000) V	6.2 µV/V + 500 µV	
	(1 to 10) kV	0.03 % + 0.03 V	Vitrek 4700 w/
	(10 to 100) kV	0.05 % + 0.3 V	HVL-100
DC Voltage – Generate[3]	(0 to 220) mV	11 µV/V + 0.4 µV	Fluke 5730A
	220 mV to 2.2 V	6.7 µV/V + 0.7 µV	
	(2.2 to 11) V	5 µV/V + 2.5 µV	
	(11 to 22) V	5.1 µV/V + 4 µV	
	(22 to 220) V	6.7 µV/V + 40 µV	
	(220 to 1100) V	8.5 µV/V + 400 µV	
DC Power − Generate[3]			
33 mV to 1020 V:			
(0.33 to 329.99) mA	(0.01 to 330) W	0.03 %	Fluke 5520A
(0.33 to 2.9999) A	(0.33 to 3.3) kW	0.03 %	
(3 to 20.5) A	(3.3 to 20.5) kW	0.09 %	

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
DC Current – Measure[3]	(0 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (1 to 100) A	13 µA/A + 0.4 nA 13 µA/A + 4.0 nA 15 µA/A + 40 nA 49 µA/A + 0.8 nA 0.019 % + 16 µA 0.041 % + 0.4 mA 0.07 %	Fluke 8508A GL 9230A/100 shunt w/ HP 3458A
DC Current – Generate[3]	(0 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A (1.2 to 3.1) A (3.1 to 12) A (12 to 30.2) Clamp-On Meters (Up to 1000) A	50 µA/A + 6 nA 44 µA/A + 7 nA 44 µA/A + 40 nA 55 µA/A + 0.7 µA 0.011 % + 12 µA 0.044 % + 480 µA 0.031 % + 0.15 mA 0.028 % + 0.25 mA 0.094 % + 0.5 mA 0.65 % + 0.5 A	Fluke 5730A ± (200 I^2) µA/A for I > 100 mA ± (10 I^2) µA/A for I > 1 A Fluke 5730A w/ 5725A Fluke 5560A Fluke 5520A w/5500 coil
Resistance – Measure[3]	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	18 µΩ/Ω + 4.0 µΩ 12 µΩ/Ω + 14 µΩ 10 µΩ/Ω + 50 µΩ 10 µΩ/Ω + 0.5 mΩ 10 µΩ/Ω + 5.0 mΩ 10 µΩ/Ω + 50 mΩ 11 µΩ/Ω + 1.0 Ω 21 µΩ/Ω + 100 Ω 0.013 % + 10 kΩ 0.016 % + 1 MΩ 0.016 % + 10 MΩ	Fluke 8508A
Resistance – Generate[3]	(0 to 12) Ω (12 to 120) Ω (0.12 to 1.2) kΩ (1.2 to 12) kΩ (12 to 120) kΩ (0.12 to 1.2 MΩ (1.2 to 12) MΩ (12 to 120) MΩ (0.12 to 1.2) GΩ	27 µΩ/Ω + 0.001 Ω 24 µΩ/Ω + 0.001 Ω 25 µΩ/Ω + 0.002 Ω 25 µΩ/Ω + 0.02 Ω 25 µΩ/Ω + 0.2 Ω 25 µΩ/Ω + 2 Ω 32 µΩ/Ω + 30 Ω 0.041 % + 2.5 kΩ 0.39 % + 100 kΩ	Fluke 5560A

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
Resistance – Generate[3] (cont)			
Fixed Points	0 Ω (1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9, 10, 19) kΩ (100, 190) kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	50 μΩ 0.012 % 31 μΩ/Ω 13 μΩ/Ω 8.2 μΩ/Ω 11 μΩ/Ω 16 μΩ/Ω 22 μΩ/Ω 50 μΩ/Ω 59 μΩ/Ω 0.013 %	Fluke 5730A
	0.001 Ω 0.01 Ω	0.012 % 0.01 %	Yokogawa 2792
	0.1 Ω 1 Ω 10 Ω 100 Ω 1k Ω 10 kΩ 100 kΩ 1 MΩ 10 MΩ	14 x 10^{-6} Ω 13 x 10^{-6} Ω 13 x 10^{-6} Ω 13 x 10^{-6} Ω 13 x 10^{-6} Ω 13 x 10^{-6} Ω 16 x 10^{-6} Ω 22 x 10^{-6} Ω 28 x 10^{-6} Ω	Guildline 9330 series standard resistors
Insulation Resistance[3] – Generate	(10 to 999.9) kΩ (1 to 9.999) MΩ (10 to 999.9) MΩ (1 to 10) GΩ	0.36 % 0.45 % 0.63 % 1.3 %	Fluke 5322A
Decade Steps	10 Ω to 10 MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.026 % 0.044 % 0.13 %	IET decade resistors 1433-22-K & HRRS-5Q

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
Capacitance – Generate[3]	50 pF to 1.2 µF	0.61 % + 5 pF	GenRad 1412-BC
Fixed Values	1 nF 10 nF 100 nF 1 µF	0.036 % 0.032 % 0.033 % 0.034 %	GenRad 1409 series capacitors
	(0.2 to 1.2) nF (1.2 to 12) nF (12 to 120) nF (0.12 to 1.2) µF (1.2 to 12) µF (12 to 120) µF (.12 to 1.2) mF (1.2 to 12) mF (12 to 120) mF	0.25 % + 2 pF 0.14 % + 5 pF 0.16 % + 30 pF 0.19 % + 0.3 nF 0.21 % + 3 nF 0.2 % + 25 nF 0.75 % + 250 nF 0.6 % + 250 nF 0.53 % + 30 µF	Fluke 5560A
Inductance – Generate			
Fixed Value	100 mH	0.14 %	GenRad 1482-L
Decade Steps	100 µH steps 1 mH steps 10 mH steps 100 mH steps 1 H steps	2.4 % per step 2.4 % per step 1.9 % per step 0.97 % per step 0.97 % per step	GenRad 1491-G decade inductor
	(13 to 120) µH (0.12 to 1.2) mH (1.2 to 12) mH (12 to 120) mH (0.12 to 1.2) H	0.25 % + 0.2 µH 0.15 % + 1 µH 0.25 % + 10 µH 0.18 % + 0.1 mH 0.25 % + 1 mH	Fluke 5560A

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Measure[3]			
Up to 200 mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.017 % + 14 µV 0.014 % + 4 µV 0.012 % + 4 µV 0.011 % + 2 µV 0.014 % + 4 µV 0.034 % + 8 µV 0.077 % + 20 µV	Fluke 8508A
200 mV to 2 V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.015 % + 0.12 mV 0.012 % + 0.02 mV 0.01 % + 0.02 mV 0.008 % + 0.02 mV 0.012 % + 0.02 mV 0.023 % + 0.04 mV 0.058 % + 0.2 mV 0.31 % + 2 mV 1 % + 20 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.015 % + 1.2 mV 0.012 % + 0.2 mV 0.01 % + 0.2 mV 0.008 % + 0.2 mV 0.012 % + 0.2 mV 0.023 % + 0.4 mV 0.058 % + 2 mV 0.31 % + 20 mV 1 % + 0.2 V	
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.015 % + 12 mV 0.012 % + 2 mV 0.01 % + 2 mV 0.008 % + 2 mV 0.012 % + 2 mV 0.023 % + 4 mV 0.058 % + 20 mV 0.31 % + 0.2 V 1 % + 2 V	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.015 % + 70 mV 0.013 % + 20 mV 0.012 % + 20 mV 0.023 % + 40 mV 0.058 % + 0.2 V	
(1 to 10) kV (10 to 70) kV	(50 to 60) Hz (50 to 60) Hz	0.15 % + 0.1 V 0.15 % + 0.6 V	Vitrek 4700 w/transfer probe

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3]			
(0.22 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz	0.19 % + 4 µV 0.12 % + 4 µV 0.086 % + 4 µV 0.15 % + 4 µV	Fluke 5730A
(0.22 to 2.2) mV	(50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.21 % + 5 µV 0.37 % + 10 µV 0.53 % + 20 µV 0.69 % + 20 µV	
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.031 % + 4 µV 0.014 % + 4 µV 0.013 % + 4 µV 0.03 % + 4 µV 0.066 % + 5 µV 0.14 % + 10 µV 0.18 % + 20 µV 0.35 % + 20 µV	
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.03 % + 12 µV 0.011 % + 7 µV 0.0073 % + 7 µV 0.015 % + 7 µV 0.038 % + 17 µV 0.08 % + 20 µV 0.17 % + 25 µV 0.34 % + 45 µV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.062 % + 40 µV 0.024 % + 15 µV 53 µV/V + 8 µV 83 µV/V + 10 µV 0.011 % + 30 µV 0.041 % + 80 µV 0.12 % + 200 µV 0.21 % + 300 µV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.029 % + 400 µV 0.012 % + 150 µV 55 µV/V + 50 µV 86 µV/V + 100 µV 0.011 % + 200 µV 0.032 % + 600 µV 0.12 % + 2 mV 0.19 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.029 % + 4 mV 0.012 % + 1.5 mV 66 µV/V + 0.6 mV 0.011 % + 1 mV 0.019 % + 2.5 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3] (cont)			
(22 to 110) V	(100 to 200) kHz	0.18 % + 16 mV	Fluke 5730A
(22 to 73) V	(200 to 300) kHz	0.18 % + 16 mV	
(22 to 55) V	(300 to 400) kHz	0.55 % + 40 mV	
(22 to 44) V	(400 to 500) kHz	0.55 % + 40 mV	
(22 to 36) V	(500 to 600) kHz	0.97 % + 80 mV	
(22 to 31) V	(600 to 700) kHz	0.97 % + 80 mV	
(22 to 27) V	(700 to 800) kHz	0.97 % + 80 mV	
(22 to 24) V	(800 to 900) kHz	0.97 % + 80 mV	
22 V	900 kHz to 1 MHz	0.97 % + 80 mV	
(220 to 1100) V	(15 to 50) Hz	0.037 % + 16 mV	Fluke 5730A w/ 5725A
	50 Hz to 1 kHz	90 µV/V + 3.5 mV	
(220 to 1100) V	40 Hz to 1 kHz	0.012 % + 4 mV	
	(1 to 20) kHz	0.02 % + 6 mV	
	(20 to 30) kHz	0.073 % + 11 mV	
(220 to 750) V	(30 to 50) kHz	0.073 % + 11 mV	
	(50 to 100) kHz	0.28 % + 45 mV	
AC Current – Measure[3]			
(0 to 200) µA	(1 to 10) Hz	0.051 % + 0.02 µA	Fluke 8508A
	10 Hz to 10 kHz	0.051 % + 0.02 µA	
	(10 to 30) kHz	0.072 % + 0.02 µA	
	(30 to 100) kHz	0.41 % + 0.02 µA	
(0.2 to 2) mA	(1 to 10) Hz	0.032 % + 0.2 µA	
	10 Hz to 10 kHz	0.031 % + 0.2 µA	
	(10 to 30) kHz	0.072 % + 0.2 µA	
	(30 to 100) kHz	0.41 % + 0.2 µA	
(2 to 20) mA	(1 to 10) Hz	0.032 % + 2 µA	
	10 Hz to 10 kHz	0.031 % + 2 µA	
	(10 to 30) kHz	0.072 % + 2 µA	
	(30 to 100) kHz	0.41 % + 2 µA	
(20 to 200) mA	(1 to 10) Hz	0.032 % + 0.02 mA	
	10 Hz to 10 kHz	0.031 % + 0.02 mA	
	(10 to 30) kHz	0.063 % + 0.02 mA	
(0.2 to 2) A	10 Hz to 2 kHz	0.063 % + 0.2 mA	
	(2 to 10) kHz	0.074 % + 0.2 mA	
	(10 to 30) kHz	0.31 % + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz	0.083 % + 2 mA	
	(2 to 10) kHz	0.26 % + 2 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.031 % + 16 nA 0.02 % + 10 nA 0.014 % + 8 nA 0.029 % + 12 nA 0.14 % + 65 nA	Fluke 5730A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.031 % + 40 nA 0.02 % + 35 nA 0.013 % + 35 nA 0.025 % + 110 nA 0.14 % + 650 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.033 % + 400 nA 0.02 % + 350 nA 0.013 % + 350 nA 0.025 % + 550 nA 0.14 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.033 % + 4 µA 0.02 % + 3.5 µA 0.013 % + 2.5 µA 0.025 % + 3.5 µA 0.14 % + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 35 µA 0.055 % + 80 µA 0.85 % + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.056 % + 170 µA 0.12 % + 380 µA 0.44 % + 750 µA	
(3.1 to 12) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.098 % + 1 mA 0.029 % + 0.5 mA 0.036 % + 0.8 mA 0.23 % + 1 mA	Fluke 5560A
(12 to 30.2) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.12 % + 10 mA 0.069 % + 8 mA 0.47 % + 8 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Clamp-On Meters[3] –			
Up to 150 A:			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.025 A 1 % + 0.027 A	Fluke 5520A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.25 A 1.3 % + 0.25 A	
(150 to 1025) A:			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.09 A 1 % + 0.1 A	
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.9 A 1.3 % + 0.9 A	

Parameter/Equipment	Range	CMC [2, 4, 7] (±)	Comments
AC Power – Generate[3]			
(45 to 65) Hz; PF=1 (33 to 330) mV:			
Range:			
(3.3 to 8.99) mA	110 µW to 3 mW	0.17 %	Fluke 5520A
(9 to 32.99) mA	(3 to 11) mW	0.12 %	
(33 to 89.99) mA	(1.1 to 30) mW	0.17 %	
(90 to 329.99) mA	(3 to 110) mW	0.12 %	
(0.33 to 0.8999) A	(11 to 300) mW	0.16 %	
(0.9 to 2.1999) A	(30 to 730) mW	0.14 %	
(2.2 to 4.4999) A	73 mW to 1.5 W	0.16 %	
(4.5 to 20.5) A	150 mW to 6.8 W	0.14 %	

Parameter/Equipment	Range	CMC [2, 4, 7] (±)	Comments
AC Power – Generate[3] (cont)			
(45 to 65) Hz; PF=1 330 mV to 1020 V:			
Range:			
(3.3 to 8.99) mA	1.1 mW to 9 W	0.15 %	Fluke 5520A
(9 to 32.99) mA	3 mW to 33 W	0.1 %	
(33 to 89.99) mA	11 mW to 90 W	0.15 %	
(90 to 329.99) mA	30 mW to 330 W	0.1 %	
(0.33 to 0.8999) A	110 mW to 900 W	0.14 %	
(0.9 to 2.1999) A	300 mW to 2200 W	0.11 %	
(2.2 to 4.4999) A	730 mW to 4500 W	0.15 %	
(4.5 to 20.5) A	(1.5 to 20.9) kW	0.12 %	

Parameter/Equipment	Frequency	CMC [2, 7] (±)	Comments
Oscilloscopes[3] –			
Square Wave Amplitude:			
50 Ω @ 1 kHz	1.0 mV to 6.6 $V_{pk - pk}$	0.23 % + 40 µV	Fluke 5560A
1 MΩ @ 1 kHz	1.0 mV to 130 $V_{pk - pk}$	0.097 % + 40 µV	SC1100
DC Voltage Amplitude:			
50 Ω Load	(0 to ± 6.6) V	0.23 % + 40 µV	
1 MΩ Load	(0 to ± 130) V	0.05 % + 40 µV	
Level Sine Wave:	Up to 1100 MHz	3.1 µHz/Hz	
Frequency	50 kHz Reference	1.9 % + 100 µV	
	50 kHz to 100 MHz	1.4 % + 100 µV	
Amplitude	(100 to 600) MHz	2.9 % + 100 µV	
	(600 to 1100) MHz	3.8 % + 100 µV	
Flatness (Bandwidth)	50 kHz to 10 MHz	1.4 % + 100 µV	
	(10 to 600) MHz	2.9 % + 100 µV	
	(600 to 1100) MHz	3.8 % + 100 µV	
Time Markers:			
Into a 50 Ω Load	0.5 ns to 5 s	3.5 µs/s	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of RTD's[3], Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.049 °C 0.049 °C 0.06 °C 0.084 °C 0.097 °C 0.11 °C 0.22 °C	Fluke 5560A
Electrical Simulation of Thermocouples[3]			
Type B	(600 to 800) °C (800 to 1820) °C	0.18 °C 0.15 °C	Fluke 5730A w/ice point reference
Type E	(-270 to 1000) °C	0.13 °C	
Type J	(-210 to 1200) °C	0.13 °C	
Type K	(-270 to 1372) °C	0.13 °C	
Type N	(-270 to 1300) °C	0.13 °C	
Type R	(-50 to 0) °C (0 to 1767) °C	0.17 °C 0.14 °C	
Type S	(-50 to 0) °C (0 to 1767) °C	0.17 °C 0.15 °C	
Type T	(-270 to 400) °C	0.13 °C	
Electrical Simulation of Thermocouples[3]			
Type E	(-250 to -150) °C (-150 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.38 °C 0.13 °C 0.11 °C 0.15 °C 0.2 °C	Fluke 5560A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.23 °C 0.12 °C 0.11 °C 0.14 °C 0.2 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouples[3] (cont)			
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.12 °C 0.11 °C 0.2 °C 0.33 °C	Fluke 5560A
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.48 °C 0.28 °C 0.26 °C 0.32 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.4 °C 0.29 °C 0.31 °C 0.39 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.15 °C 0.11 °C 0.11 °C 0.2 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.56 °C 0.19 °C 0.12 °C 0.11 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.38 °C 0.11 °C	

Parameter/Frequency	Range	CMC[2] (±)	Comments
Electrical Calibration of Process Meters –			
Thermocouple Output[3]:			
Type B	(600 to 1820) °C	0.13 °C	HP 3458A w/ice point reference
Type E	(-270 to 1000) °C	0.13 °C	
Type J	(-210 to 1200) °C	0.13 °C	
Type K	(-270 to 1372) °C	0.13 °C	
Type N	(-270 to 1300) °C	0.13 °C	
Type R	(-50 to 1767) °C	0.13 °C	
Type S	(-50 to 1767) °C	0.13 °C	
Type T	(-270 to 400) °C	0.13 °C	
Electrical Calibration of Process Meters –			
Type E	(-250 to -150) °C (-150 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.38 °C 0.13 °C 0.11 °C 0.15 °C 0.2 °C	Fluke 5560A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.23 °C 0.12 °C 0.11 °C 0.14 °C 0.2 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.12 °C 0.11 °C 0.2 °C 0.33 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.48 °C 0.28 °C 0.26 °C 0.32 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Process Meters – (cont)			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.4 °C 0.29 °C 0.31 °C 0.39 °C	Fluke 5560A
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.15 °C 0.11 °C 0.11 °C 0.2 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.56 °C 0.19 °C 0.12 °C 0.11 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.38 °C 0.11 °C	

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
Distortion – Measure			
20 Hz to 100 kHz Fundamental Frequency:			
Input: 50 mV to 300 V: (0 to 99.9) dB Dist.	20 Hz to 100 kHz	2.5 %	HP 8903B

VI. Electrical – RF/Microwave

Parameter/Frequency	Frequency	CMC[2, 4, 7] (±)	Comments
RF Power – Measure			
(-70 to -20) dBm 100 pW to 10 µW	10 MHz to 18 GHz	1.2 %	HP437B/8484A/ 11708A
(-20 to 30) dBm 1 µW to 100 mW	100 kHz to 4.2 GHz	1.1 %	HP437B/8482A
(-20 to 30) dBm 1 µW to 100 mW	10 MHz to 18 GHz	1.1 %	HP437B/8481A

VII. Mechanical

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Scales & Balances[3]	(1 to 500) mg Up to 5 g Up to 10 g Up to 30 g Up to 50 g Up to 100 g Up to 200 g Up to 300 g Up to 500 g Up to 1000 g (> 1 to 35) kg	0.013 mg + 0.6*R* 0.043 mg + 0.6*R* 0.062 mg + 0.6*R* 0.096 mg + 0.6*R* 0.17 mg + 0.6*R* 0.31 mg + 0.6*R* 0.63 mg + 0.6*R* 0.92 mg + 0.6*R* 1.5 mg + 0.6*R* 3.1 mg + 0.6*R* 3.1 mg per 1000 g + 0.6*R*	ASTM Class 1 weights (applied load)
	(5 to 10) g (10 to 500) g 501 g to 20 kg (> 20 to 5000) kg	0.04 % + 0.6*R* 0.025 % + 0.6*R* 0.017 % + 0.6*R* 0.017 % per 20 kg + 0.6*R*	Class F weights (applied load)
	Up to 1000 lb (1000 to 120 000) lb	0.017 % + 0.6*R* 0.017 % per 1000 lb + 0.6*R*	Class F weights (applied load)
Mass – Field Check Weight Comparison[3] –			
Load Fixtures, Hangers, Package & Check Weights	Up to 1000 g	6.5 mg	Balance w/ Class 1 mass standards
	Up to 70 lb	0.035 %	Scale w/ Class F weights

Parameter/Equipment	Range	CMC[2] (±)	Comments
Mass – Fixed Points	1/32 oz 1/16 oz 1/8 oz ¼ oz ½ oz 1 oz 2 oz 4 oz 0.001 lb 0.002 lb 0.005 lb 0.01 lb 0.02 lb 0.05 lb 0.1 lb 0.2 lb 0.5 lb 1 lb 2 lb 3 lb 4 lb 5 lb 10 lb 20 lb 25 lb 50 lb 1 mg 2 mg 3 mg 5 mg 10 mg 20 mg 30 mg 50 mg 100 mg 200 mg 300 mg 500 mg 1 g 2 g 3 g 5 g	6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 6.1 µoz (180 µg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.4 µlb (1.1 mg) 2.7 µlb (1.2 mg) 2.4 µlb (1.1 mg) 2.8 µlb (1.3 mg) 3.1 µlb (1.4 mg) 4.2 µlb (1.9 mg) 2.8 µlb (1.3 mg) 8 µlb (3.6 mg) 11 µlb (4.8 mg) 670 µlb (310 mg) 610 µlb (280 mg) 0.0051 mg 0.0038 mg 0.0039 mg 0.0033 mg 0.0035 mg 0.0052 mg 0.0038 mg 0.0033 mg 0.0053 mg 0.0034 mg 0.0032 mg 0.0038 mg 0.010 mg 0.010 mg 0.010 mg 0.010 mg	By comparison w/ ASTM class 1 weights By comparison w/ ultra-class weights

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Mass – Fixed Points (cont)	10 g 20 g 25 g 30 g 40 g 50 g 100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 4 kg 5 kg 10 kg 20 kg 25 kg	0.012 mg 0.014 mg 0.015 mg 0.013 mg 0.016 mg 0.022 mg 0.033 mg 0.1 mg 0.12 mg 0.21 mg 0.34 mg 2.4 mg 2.5 mg 2.8 mg 5.7 mg 4.1 mg 17 mg 20 mg	By comparison w/ ASTM class 1 weights
Torque – Measure (Wrenches)[3]	(5 to 50) ozf·in (50 to 200) ozf·in 5 lbf·in to 2000 lbf·ft	0.81 % 0.84 % 0.65 %	CDI Suretest 5000-ST
Torque – Measuring Equipment[3]	Up to 2000 lbf·ft	0.13 %	Class F weights & torque arms
Rotary Torque – Measure[3], Pneumatic, DC, Pulse	(0.2 to 250) N·m	0.8 %	Mountz w/ rotary transducers
Force – Measuring Equipment[3]	(0.002 to 3000) lbf (200 to 50 000) lbf (50 001 to 100 000) lbf	0.05 % 0.04 % 0.06 %	Class F weights Morehouse universal 100K

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Durometer Calibration – (Type A, B, C, D, DO, O, OO)			ASTM D2240
Indentor Extension & Shape:			
Diameter	Up to 0.105 in	120 µin	Vision system
Radius	Up to 0.125 in	120 µin	
Angle	(25 to 40)°	0.16°	
Extension	Up to 0.105 in	70 µin	Gage blocks
Indentor Display	(0 to 100) duro units	0.7 duro units	Gage blocks
Spring Calibration – Force	Up to 45 N	0.032 N	Precision bench scale
Type A, B, E, O	(0.55 to 8.05) N (0 to 100) duro	0.046 N 0.61 duro	RDC-1
Type C, D, DO	(0 to 44.45) N (0 to 100) duro	0.27 N 0.61 duro	RDC-1
Pressure[3] – Measuring Equipment			
Absolute	(0 to 100) psia	0.08 psia	Fluke 754 w/ 750PA6
Differential	(0 to 28) in·H_2O	0.03 % of FS	Meriam M200-LS
Pneumatic	Up to 300 psig	0.07 % of IV	Beamex MC5
Hydraulic	(100 to 1000) psig (1000 to 10 000) psig	0.03 % of FS 0.03 % of FS	Additel ADT681-1K Additel ADT681-10K
Vacuum[3] – Measuring Equipment	(0.01 to 28) in·Hg	0.09 %	Beamex MC5
Totalize Meters[3] – (Length Counters & Totalizers)			
Distance Measure	Up to 2000 yards	0.7 %	Monarch PLT200 w/ encoder wheel

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
Speed[3] – Measure Optic/Non-Contact: RPM Totalizer/Rate Meters Contact: RPM Totalizer/Rate Meters	 (5 to 200 000) rpm (2 to 3300) fpm (0.5 to 12 000) rpm (2 to 3300) fpm	 0.017 % 0.017 % 0.22 % 0.22 %	 Monarch PLT200
Speed/RPM/Rate[3] – Simulation	(2.5 to 100 000) rpm	0.0028 % + 0.6*R*	Keysight 33220A
Tensile Tester[3] – Speed/Rate Displacement	 Up 50 in/min Up to 20 in	 0.042 % 0.000 25 in	 Timer & steel ruler Gage blocks w/ indicator
Indirect Verification of Rockwell Hardness Testers[3]	HRC: Low Medium High HRBW: Low Medium High HR30T: Low Medium High	 0.84 HRC 0.84 HRC 0.81 HRC 0.83 HRBW 0.82 HRBW 0.81 HRBW 0.81 HRT 0.82 HRT 0.81 HRT	Indirect verification per ASTM E18

VIII. Optical Quantities

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Illuminance – Light Meters (360 to 780) nm @ 2856 K	 (0.1 to 10 000) Lux	 2.7 %	 Comparison by standard light meter

IX. Thermodynamics

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Temperature – Measuring Equipment[3]	(-35 to 50) °C (50 to 150) °C (150 to 660) °C	0.064 °C 0.072 °C 0.093 °C	Wahl CLB31 w/ reference probe Fluke 9173 w/reference probe
Temperature – Measure[3]	(-196 to 300) °C (300 to 670) °C	0.039 °C 0.071 °C	Fluke 1529 w/5628
Plate Temperature – Infrared Measuring Devices[3]	35 °C (35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.84 °C 0.95 °C 1.2 °C 1.7 °C 2.3 °C	Fluke 4181 $\varepsilon = 0.95$ $\lambda = 8$ to 14 µm
Relative Humidity – Measure[3]	(10 to 90) % RH	1.0 % RH	Rotronic HC2-SH
Relative Humidity – Measuring Equipment[3]	(20 to 90) % RH	1 % RH	Rotronic HC2-SH & humidity generator

X. Time & Frequency

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Frequency – Measuring Equipment	Up to 80 MHz 100 kHz to 6 GHz	0.06 µHz/Hz 0.06 µHz/Hz	Keysight 33250A w/ external timebase N5181A w/ external timebase
Frequency – Measure	Up to 15 GHz	0.06 µHz/Hz	Keysight 53230A
Timers & Stopwatches[3]	(1 to 3600) s	0.026 s	Keysight 53230A

[1] This laboratory offers commercial calibration and field calibration services and is performed at the main laboratory.

[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 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] The standards used don't include the individual load cells calibrated using ASTM standards & methods.

[6] In the statement of CMC, *L* is the numerical value of the nominal length of the device; *R* is the numerical value of the resolution of the device. *DL* is the diagonal length of the device.

[7] In the statement of CMC a percentage refers to percent of reading unless otherwise noted.

[8] This laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.

[9] 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.

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

Accredited Laboratory

A2LA has accredited

CROSS TECHNOLOGIES, INC

Whitsett, NC

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 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 12th day of December 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.02
Valid to November 30, 2026
Revised January 19, 2026

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