



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: May 31, 2025

Certificate Number: 1741.05

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 12}:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters ³	4 pH 7 pH 10 pH	0.03 pH units 0.04 pH units 0.07 pH units	Standard pH solutions
Conductivity Meters ³	1 µS/cm 5 µS/cm 10 µS/cm 100 µS/cm 1000 µS/cm	0.56 µS/cm 0.56 µS/cm 0.56 µS/cm 2.2 µS/cm 5.2 µS/cm	Standard conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Calipers ³	Up to 80 in	(5.7 + 9.4L) µin + 0.6R	Gage blocks
Micrometers ³ – Outside	Up to 80 in	(5.7 + 9.4L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Linear Indicators ³ – Dial & Test	Up to 4 in	$(5.9 + 9.1L) \mu\text{in} + 0.6R$	Gage blocks
Height Gages ³	Up to 48 in	$(24 + 2L) \mu\text{in} + 0.6R$	Gage blocks, surface plate
Steel Rules ³	Up to 72 in	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Tape Measures ³	Up to 25 ft	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Angle Indicators & Protractors ³	30°, 45°, 60°, 75°, 90° Up to 60°	0.03° 0.0084°	Angle block set Sine bar
Hand Tools ³ – Depth Gages, Snap Gages, & Thickness Gages	Up to 4 in	$(5.9 + 9.1L) \mu\text{in} + 0.6R$	Gage blocks
Feeler Gages	Up to 1 in	75 μin	Digital micrometer
Optical Comparators ³ – Magnification X – Y Linearity Angle ⁹	10× to 250× Up to 12 in Up to 90°	0.014 in 150 μin 0.1°	Grid plate, glass master & scale Angle block set
Surface Plates ³ – Repeatability Only/Local Flatness Flatness	0.002 in Up to 60 <i>DL</i> (> 60 to 120) <i>DL</i>	33 μin $(31 + 0.2 \text{ } DL) \mu\text{in}$ $(30 + 0.3 \text{ } DL) \mu\text{in}$	Repeat-o-meter Federal level systems
Pin Gages ³ – Class Z & ZZ	Up to 1 in	41 μin	Micrometer

Parameter/Equipment	Range	CMC ² (±)	Comments
Diameter/Radius/Angle Fixture Gages –			
Diameter	Up to 12.0 in	240 µin	Optical comparator
Radius	Up to 12.0 in	240 µin	
Length	Up to 12.0 in	240 µin	
Angle Gages	Up to 90°	0.16°	

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
DC Voltage – Measure ³	(0 to 100) mV (0.1 to 1.0) V (1 to 10) V (10 to 100) V (100 to 1000) V (Up to 10) kV (10 to 100) kV	7.8 µV/V + 0.2 µV 4.4 µV/V + 0.3 µV 4.4 µV/V + 0.5 µV 6.8 µV/V + 30 µV 7 µV/V + 0.5 mV 0.05 % + 0.03 V 0.07 % + 0.3 V	Fluke 8588A Vitrek 4700 w/ HVL-100
DC Voltage – Generate ³	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	11 µV/V + 0.4 µV 6.7 µV/V + 0.7 µV 5 µV/V + 2.5 µV 5.1 µV/V + 4 µV 6.7 µV/V + 40 µV 8.5 µV/V + 400 µV	Fluke 5730A
DC Current – Measure ³	(1 to 100) nA (0.1 to 1) µA (1 to 10) µA (10 to 100) µA (0.1 to 1.0) mA (1 to 10) mA (10 to 100) mA (0.1 to 1.0) A (1 to 10) A (1 to 30) A	32 µA/A + 0.04 nA 23 µA/A + 0.04 nA 23 µA/A + 0.1 nA 10 µA/A + 0.4 nA 10 µA/A + 4 nA 15 µA/A + 40 nA 58 µA/A + 1 µA 0.014 % + 0.1mA 0.024 % + 0.4 mA 0.056 % + 4.4 mA	HP 3458A Fluke 8588A

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
DC Current – Measure ³ (cont)	(1 to 20) A	0.017 %	Fluke Y5020 w/ HP 3458A
	(20 to 100) A	0.25 %	Empro 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	50 µA/A + 6 nA 44 µA/A + 7 nA 44 µV/V + 40 nA 55 µV/V + 0.7 µA	Fluke 5730A * ± (200 I ²) µA/A for I > 100 mA
	220 mA to 2.2 A	0.011 % + 12 µA	± (10 I ²) µA/A for I > 1 A
	(2.2 to 11) A	0.044 % + 480 µA	Fluke 5730A w/ Fluke 5725A
	(11 to 21) A	0.12 % + 750 µA	Fluke 5522A
DC Clamp-On Meters ³ – (Non-Toroidal)	(20.5 to 1000) A	0.65 % + 0.5 A	Fluke 5522A w/ 5500 coil
DC Power – Generate ³ 33 mV to 1020 V (0.33 to 329.99) mA (0.33 to 2.9999) A (3 to 20.5) A	(0.01 to 330) W (0.33 to 3.3) kW (3.3 to 20.5) kW	0.03 % 0.03 % 0.09 %	Fluke 5522A
Resistance – Measure ³	(0 to 1) Ω (1 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ (1 to 10) GΩ	19 µΩ/Ω + 4.0 µΩ 11 µΩ/Ω + 14 µΩ 9.6 µΩ/Ω + 50 µΩ 9.4 µΩ/Ω + 0.5 mΩ 9.4 µΩ/Ω + 5.0 mΩ 9.6 µΩ/Ω + 50 mΩ 11 µΩ/Ω + 1 Ω 24 µΩ/Ω + 100 Ω 0.013 % + 10 kΩ 0.14 % + 1 MΩ 0.14 % + 10 MΩ	Fluke 8588A

Parameter/Equipment	Range	CMC ^{2, 4, 6} ($\pm$)	Comments
Resistance – Generate ³			
Fixed Points	0 Ω (1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9, 10, 19) k Ω (100, 190) k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	50 $\mu\Omega$ 0.012 % 31 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ 8.2 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 22 $\mu\Omega/\Omega$ 50 $\mu\Omega/\Omega$ 59 $\mu\Omega/\Omega$ 0.013 %	Fluke 5730A
	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 k Ω (1.1 to 11) k Ω (11 to 110) k Ω 110 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω	49 $\mu\Omega/\Omega + 0.001 \Omega$ 51 $\mu\Omega/\Omega + 0.0015 \Omega$ 34 $\mu\Omega/\Omega + 0.0014 \Omega$ 34 $\mu\Omega/\Omega + 0.002 \Omega$ 34 $\mu\Omega/\Omega + 0.02 \Omega$ 34 $\mu\Omega/\Omega + 0.2 \Omega$ 39 $\mu\Omega/\Omega + 2 \Omega$ 73 $\mu\Omega/\Omega + 30 \Omega$ 0.014 % + 50 Ω 0.03 % + 2.5 k Ω 0.06 % + 3 k Ω 0.36 % + 100 k Ω 1.8 % + 500 k Ω	Fluke 5522A
Insulation Resistance ³	1 M Ω , 10 M Ω , 100 M Ω , 1 G Ω , 10 G Ω , 100 G Ω	1.2 %	Local resistor set

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
Capacitance – Generate ³ (220 to 399.9) pF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) µF (1.1 to 3.29999) µF (3.3 to 10.9999) µF (11 to 32.9999) µF (33 to 109.999) µF (110 to 329.999) µF (0.33 to 1.099 99) mF (1.1 to 3.299 99) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	(10 to 10 000) Hz (10 to 10 000) Hz (10 to 3000) Hz (10 to 1000) Hz (10 to 1000) Hz (10 to 1000) Hz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	0.88 % + 10 pF 0.6 % + 0.01 nF 0.6 % + 0.01 nF 0.31 % + 0.1 nF 0.31 % + 0.1 nF 0.31 % + 0.3 nF 0.31 % + 1 nF 0.31 % + 3 nF 0.31 % + 10 nF 0.49 % + 30 nF 0.55 % + 100 nF 0.55 % + 300 nF 0.55 % + 1 µF 0.55 % + 3 µF 0.56 % + 10 µF 0.91 % + 30 µF 1.4 % + 100 µF	Fluke 5522A
AC Voltage – Generate ³ (0.22 to 2.2) mV (2.2 to 22) mV (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 (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 (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	0.19 % + 4 µV 0.12 % + 4 µV 0.086 % + 4 µV 0.15 % + 4 µV 0.21 % + 5 µV 0.37 % + 10 µV 0.53 % + 20 µV 0.69 % + 20 µV 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 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	Fluke 5730A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont)			
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	Fluke 5730A
(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 (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.029 % + 4 mV 0.012 % + 1.5 mV 66 µV/V + 0.6 mV 0.011 % + 1 mV 0.019 % + 2.5 mV 0.11 % + 16 mV 0.53 % + 40 mV 0.97 % + 80 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.037 % + 16 mV 90 µV/V + 3.5 mV	45V max @ 500 kHz 22V max @ 1 MHz Refer to volt-hertz capability chart
(220 to 1100) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.012 % + 4 mV 0.02 % + 6 mV 0.073 % + 11 mV	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.073 % + 11 mV 0.28 % + 45 mV	Fluke 5730A w/5725A

Parameter/Range	Frequency	CMC ^{2, 4} ($\pm$)	Comments
AC Voltage – Measure ³			
(0 to 10) mV	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.034 % + 1.1 μ V 0.041 % + 1.1 μ V 0.042 % + 1.1 μ V 0.031 % + 1.1 μ V 1.1 % + 4 μ V 2.1 % + 4 μ V	Fluke 8588A
(10 to 100) mV	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.01 % + 0.5 μ V 0.014 % + 0.4 μ V 0.024 % + 1 μ V 0.054 % + 5 μ V 0.22 % + 30 μ V 1.2 % + 0.1 mV	
(0.1 to 1) V	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.008 % + 5 μ V 0.013 % + 5 μ V 0.024 % + 10 μ V 0.054 % + 50 μ V 0.22 % + 0.3 mV 1.1 % + 1 mV	
(1 to 10) V	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.008 % + 50 μ V 0.013 % + 50 μ V 0.024 % + 0.1 mV 0.054 % + 0.5 mV 0.22 % + 3 mV 1.1 % + 10 mV	
(10 to 100) V	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.016 % + 0.5mV 0.017 % + 0.5mV 0.027 % + 1 mV 0.061 % + 5 mV 0.38 % + 50 mV 1.2 % + 0.5 V	
(100 to 1000) V	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.012 % + 25 mV 0.012 % + 25 mV 0.025 % + 25 mV 0.06 % + 0.1 V	Fluke 8588A
(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	Vitretek 4700 w/ HVL-100

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Current – Generate ³			
(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	Fluke 5730A
(11 to 20.5) A	45 Hz to 1 kHz	0.19 % + 5 mA	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Clamp-On Meters ³ – (10 to 150) A Toroidal Non-Toroidal (150 to 1025) A Toroidal Non-Toroidal	 (45 to 65) Hz (65 to 440) Hz (45 to 65) Hz (65 to 440) Hz (45 to 65) Hz (65 to 440) Hz (45 to 65) Hz (65 to 440) Hz	 0.49 % + 0.025 A 1 % + 0.027 A 0.76 % + 0.25 A 1.3 % + 0.25 A 0.49 % + 0.09 A 1 % + 0.1 A 0.76 % + 0.9 A 1.3 % + 0.9 A	 Fluke 5522A Fluke 5520A w/ 5500 coil
AC Current – Measure ³ (0 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	 0.21 % + 2.5 nA 0.21 % + 2.5 nA 0.21 % + 2.5 nA 0.029 % + 5 nA 0.054 % + 5 nA 0.075 % + 5 nA 0.41 % + 10 nA 0.029 % + 50 nA 0.054 % + 50 nA 0.075 % + 50 nA 0.41 % + 0.1 µA 0.029 % + 0.5 µA 0.054 % + 0.5 µA 0.075 % + 0.5 µA 0.41 % + 1 µA 0.029 % + 5 µA 0.053 % + 5 µA 0.075 % + 5 µA 0.031 % + 0.1 mA 0.056 % + 0.1 mA 0.08 % + 0.1 mA	 Fluke 8588A

[Signature]

Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
AC Current – Measure ³ (cont)			
(1 to 10) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 0.5 mA 0.085 % + 0.5 mA	Fluke Y5020 w/ HP 3458A
(10 to 30) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 12 mA 0.13 % + 12 mA	Empro shunt w/ HP 3458A
(1 to 20) A	Up to 1 kHz	0.022 %	
(20 to 100) A	Up to 60 Hz	0.27 %	

Parameter/Equipment	Range	CMC ^{2, 6, 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 5522A
(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 %	
330 mV to 1020 V Range			
(3.3 to 8.99) mA	1.1 mW to 9 W	0.15 %	
(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	Range	CMC ² (±)	Comments
Oscilloscopes ³ –			
Square Wave Signal:			
50 Ω Load @ 1 kHz	1 mV to 6.6 V _{pk - pk}	0.31 % + 40 μV	Fluke 5522A w/ SC1100
1 MΩ Load @ 1 kHz	1 mV to 130 V _{pk - pk}	0.14 % + 40 μV	
DC Volt Amplitude:			
50 Ω Load	(0 to 6.6) V	0.3 % + 40 μV	
1 MΩ Load	(0 to 130) V	0.06 % + 40 μV	
Level Sine Wave:			
Frequency	(0 to 1100) MHz	3.3 μHz/Hz	Fluke 5522A w/ SC1100
Amplitude	50 kHz Reference	2.4 % + 300 μV	
	50 kHz to 100 MHz	4.2 % + 300 μV	
	(100 to 300) MHz	4.8 % + 300 μV	
	(300 to 600) MHz	7.2 % + 300 μV	
	(300 to 1100) MHz	8.4 % + 300 μV	
Flatness (Bandwidth)	0 kHz to 100 MHz	1.8 % + 100 μV	
	(100 to 300) MHz	2.4 % + 100 μV	
	(300 to 600) MHz	4.8 % + 100 μV	
	(300 to 1100) MHz	6 % + 100 μV	
Time Markers:			
Into a 50 Ω Load	5 s to 50 ms	(30 + 1000t) μs/s	
	20 ms to 2 ns	3.5 μs/s	
Rise Time:			
1 kHz to 2 MHz	≤ 300 ps	130 ps	
	≤ 350 ps	130 ps	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouples ³ –			Fluke 5522A
Type B	(600 to 800) °C (800 to 1820) °C	0.53 °C 0.43 °C	
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.56 °C 0.20 °C 0.26 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.33 °C 0.20 °C 0.17 °C 0.21 °C 0.28 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.40 °C 0.22 °C 0.20 °C 0.32 °C 0.48 °C	
Type N	(-210 to -100) °C (-100 to 410) °C (410 to 1300) °C	0.50 °C 0.30 °C 0.36 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.70 °C 0.42 °C 0.50 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.58 °C 0.46 °C 0.57 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.76 °C 0.30 °C 0.21 °C	
Electrical Simulation of RTDs ³			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.08 °C 0.10 °C 0.11 °C 0.13 °C 0.15 °C 0.28 °C	Fluke 5522A
	(-200 to 100) °C (100 to 800) °C	0.07 °C 0.17 °C	Fluke 754

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 4, 6} ($\pm$)	Comments
RF Power – Measure (-20 to 30) dBm 1 μ W to 100 nW	100 kHz to 4.2 GHz	1.5 %	Keysight N1913A/8482A

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6, 11} ($\pm$)	Comments
Torque Wrenches ³	40 ozf·in to 600 lbf·ft	0.65 %	CDI suretest 5000-ST
Torque Testers	Up to 1000 lbf·ft	0.08 %	Class F weights w/ torque arms
Rotary Torque Tools ³ – Pneumatic, DC, Pulse	(0.02 to 2) N·m (0.2 to 20) N·m (0.75 to 75) N·m (18 to 180) N·m	1.3 % full scale	Crane-torque star w/ rotary transducers Note: Full scale of reference device
Force ³ Measuring Equipment – Tension & Compression	Up to 5 000 lbf	0.05 % + 0.6R	Standard weights
(Field Only)	Up to 10 000 lbf	0.35 %	Load cells w/ indicator
Compression Only (Field Only)	(12 000 to 200 000) lbf	0.31 %	Load cells w/ indicator

Parameter/Equipment	Range	CMC ^{2, 6, 11} ($\pm$)	Comments
Absolute & Barometric Pressure Measuring Equipment ³	(0 to 60) in-Hg	0.08 in-Hg	Druck DPI705
Atmospheric Pressure Measuring Equipment (Vacuum ³)	(0 to 28.5) in-Hg	0.07 % of full scale	Fluke 754 w/ 700PD6
Mass Measure – Field Check Weight Comparison ³ Load Fixtures, Hangers, Package & Check Weights	Up to 70 lbs	0.07 %	Scale w/ Class F weights
Indirect Verification of Rockwell Hardness Testers ³	HRC: Low Medium High HRB W: Low Medium High HRA: Low Medium High HR15T: Low Medium High	0.59 HRC 0.58 HRC 0.61 HRC 0.51 HRBW 0.44 HRBW 0.48 HRBW 0.41 HRA 0.34HRA 0.34 HRA 0.67 HR15T 0.65 HR15T 0.60 HR15T	Indirect verification per ASTM E18
Speed/RPM/Rate Simulation	(6 to 200 000) rpm	0.003 %	Agilent 33220A frequency synthesizer

Parameter/Equipment	Range	CMC ^{2, 6, 11} ($\pm$)	Comments
Durometer Calibration – (Type A, B, C, D, DO, O, OO)			ASTM D2240
Indenter Extension & Shape –			
Diameter	Up to 0.105 in	240 μ in	Optical comparator
Radius	Up to 0.125 in	240 μ in	
Angle	(25 to 40) °	0.16°	
Extension	Up to 0.105 in	70 μ in	Gage blocks
Indenter Display	(0 to 100) duro units	0.7 durometer units	
Spring Calibration – Force	Up to 45 N	0.032 N	Precision bench scale
Speed ³ – Measure			
Optic/Non-Contact:			
RPM	(6 to 200 000) rpm	0.018 %	Monarch PLT200
Totalizer/Rate Meters	(2 to 3300) fpm	0.018 %	
Contact:			
RPM	(6 to 20 000) rpm	0.22 %	
Totalizer/Rate Meters	(2 to 3300) fpm	0.22 %	

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 11} ($\pm$)	Comments
Temperature – Measure ³	(0 to 100) °C	0.04 °C	Fluke 1524 w/ thermistor probe
	(-80 to 156) °C	0.07 °C	Fluke 1524 w/ PRT probe
	(-40 to 420) °C	0.16 °C	Fluke 1523 w/ PRT probe

Parameter/Equipment	Range	CMC ^{2, 10, 11} (±)	Comments
Temperature – Measuring Instruments ³	(-30 to 125) °C	0.087 °C	Fluke 7103 w/ reference probe
	(35 to 350) °C	0.65 °C	Fluke 9144
Infrared Temperature Indicators ³ (Optical Pyrometers)	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, emissivity = 0.95 (8 to 14) µm
Relative Humidity – Measure ³	(10 to 90) % RH	1.5 % RH	Vaisala MI-70 w/ HMP76B probe
Relative Humidity – Measuring Equipment ³	(25 to 90) % RH	1.5 % RH	Vaisala MI-70 w/ HMP76B probe w/ controlled environment

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
Frequency – Measuring Equipment ³	0.01 Hz to 2 MHz	5.6 µHz/Hz + 5 µHz	Fluke 5522A
Frequency – Measure	(Up to 350) MHz	0.06 µHz/Hz	Keysight 53230A
Timers & Stopwatches ³	(1 to 3600) s	0.021s	Keysight 53230A

¹ This laboratory offers commercial calibration and dimensional testing services, and field calibration and field dimensional testing services, where noted.

- 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. CMC's 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; R is the numerical value of the resolution of the device in its respective units; DL is the diagonal length of the device in inches.
- ⁶ In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted.
- ⁷ In the statement of CMC, t represents the time in seconds.
- ⁹ This test is not equivalent to that of a calibration
- ¹⁰ Applicable to Optical Comparators ONLY.
- ¹¹ 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.
- ¹² This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

CROSS TECHNOLOGIES, INC DBA CROSS (FORMERLY J.A. KING)
RALEIGH, 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 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 6th day of December 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.05
Valid to May 31, 2025
Revised March 8, 2024.

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