



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: May 31, 2023

Certificate Number: 1741.18

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,11}:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meters ³ – Fixed Points	4 pH 7 pH 10 pH	0.031 pH 0.027 pH 0.034 pH	Standard pH solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Pin Gages ³ – Class ZZ	Up to 1.0 in	140 µin	Bench micrometer
Calipers ³	Up to 40 in	(4.5 + 9.9L) µin + 0.6R	Gage blocks
Coating Thickness Gages ³ (Film, Ultrasonic)	Up to 20 mils	0.1 mils	Coating thickness standards
Micrometers ³	Up to 40 in	(4.5 + 9.9L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range	CMC ² (±)	Comments
Linear Indicators ³ – Dial & Test	Up to 4 in	$(3 + 9.4L) \mu\text{in} + 0.6R$	Gage blocks
Steel Rules ³	Up to 72 in	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Height Gages ³	Up to 48 in	$(53 + 8.9L) \mu\text{in}$	Gage blocks
Length – 1D ³	Up to 12 in	0.0021 in	Digital caliper
Hand Tools – Depth Gages, Snap Gages, Fixture Gages, Thickness Gages	Up to 4 in	$(6.4 + 3.1L) \mu\text{in}$	Gage blocks
Tape Measures ³	Up to 25 ft	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Optical Comparator ³ – X-Y Linearity Magnification Angle	Up to 6 in 10x to 250x 0° to 90°	86 μin 0.014 in 0.1°	Glass scale Glass ruler Angle block set
Feeler/Thickness Gages ³	Up to 1 in	140 μin	Bench micrometer
Surface Plates ³ – Grades AA, A, & B Repeatability/Local Flatness Flatness	0.002 in Up to 60 <i>DL</i> in (>60 to 120) <i>DL</i> in	40 μin $(31 + 0.2DL) \mu\text{in}$ $(30 + 0.3DL) \mu\text{in}$	Repeat-o-meter Mahr federal level systems
Surface Roughness Meters ³	Ra (10 to 200)	1.1 μin	Precision roughness standard

Parameter/Equipment	Range	CMC ² (±)	Comments
Protractor & Angle Indicators ³	1°, 2°, 3°, 4°, 5°, 10°, 15°, 20°, 25°, 30°	0.03°	Angle block set
	45°, 60°, 75°, 90°	0.03°	

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 5, 6} (±)	Comments	
DC Voltage – Measure ³	(0 to 200) mV	5.8 $\mu\text{V}/\text{V}$ + 0.1 μV	Fluke 8508A	
	200 mV to 2 V	4.7 $\mu\text{V}/\text{V}$ + 0.4 μV		
	(2 to 20) V	4.5 $\mu\text{V}/\text{V}$ + 4.0 μV		
	(20 to 200) V	6.2 $\mu\text{V}/\text{V}$ + 40 μV	Vitretek 4700	
	(200 to 1000) V	6.2 $\mu\text{V}/\text{V}$ + 500 μV		
	(1 to 10) kV	0.05 % + 0.3 V		
	(10 to 100) kV	0.06 % + 0.2 V	Vitretek 4700 w/ HVL-100	
	DC Voltage – Generate ³	(0 to 220) mV	11 $\mu\text{V}/\text{V}$ + 0.4 μV	Fluke 5720A
		220 mV to 2.2 V	6.7 $\mu\text{V}/\text{V}$ + 0.7 μV	
(2.2 to 11) V		5 $\mu\text{V}/\text{V}$ + 2.5 μV		
(11 to 22) V		5.1 $\mu\text{V}/\text{V}$ + 4.0 μV		
(22 to 220) V		6.7 $\mu\text{V}/\text{V}$ + 40 μV		
(220 to 1100) V		8.5 $\mu\text{V}/\text{V}$ + 400 μV		
DC Current – Measure ³	(0 to 200) μA	13 $\mu\text{A}/\text{A}$ + 0.4 nA	Fluke 8508A	
	200 μA to 2 mA	13 $\mu\text{A}/\text{A}$ + 4.0 nA		
	(2 to 20) mA	15 $\mu\text{A}/\text{A}$ + 40 nA		
	(20 to 200) mA	49 $\mu\text{A}/\text{A}$ + 0.8 nA		
	200 mA to 2 A	0.019 % + 16 μA		
	(2 to 20) A	0.041 % + 0.4 mA		
	(1 to 100) A	0.073 %	GL 9230A/300 shunt w/ DMM	

Parameter/Equipment	Range	CMC ^{2, 4, 5, 6} (±)	Comments
DC Current – Generate ³	(0 to 220) μ A 220 μ A to 2.2 mA (2.2 to 22) mA 22 mA to 220 mA 220 mA to 2.2 A (1.1 to 3) A (2 to 11) A (11 to 20.5) A (1 to 100) A	50 μ A/A + 6.0 nA 44 μ A/A + 7.0 nA 44 μ A/A + 40 nA 55 μ A/A + 0.7 μ A 0.011 % + 12 μ A 0.046 % + 40 μ A 0.06 % + 500 μ A 0.12 % + 750 μ A 0.073 %	Fluke 5720A \pm (200 I ²) μ A/A for I > 100 mA \pm (10 I ²) μ A/A for I > A Fluke 5522A GL 9230A/300 shunt w/ DMM and power supply
DC Current – Generate ³ Clamp-On-Meters	Up to 1000 A	0.65 % + 0.5 A	Fluke 5522A w/ 5500 coil
Resistance – Measure ³	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω 200 M Ω to 2 G Ω (2 to 20) G Ω	18 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 14 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 0.5 m Ω 10 $\mu\Omega/\Omega$ + 5.0 m Ω 10 $\mu\Omega/\Omega$ + 50 m Ω 11 $\mu\Omega/\Omega$ + 1.0 Ω 21 $\mu\Omega/\Omega$ + 100 Ω 0.013 % + 10 k Ω 0.016 % + 1 M Ω 0.016 % + 10 M Ω	Fluke 8508A
Resistance – Generate ³	(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	54 $\mu\Omega/\Omega$ + 0.001 Ω 52 $\mu\Omega/\Omega$ + 0.0015 Ω 35 $\mu\Omega/\Omega$ + 0.0014 Ω 35 $\mu\Omega/\Omega$ + 0.002 Ω 35 $\mu\Omega/\Omega$ + 0.02 Ω 36 $\mu\Omega/\Omega$ + 0.2 Ω 40 $\mu\Omega/\Omega$ + 2 Ω 74 $\mu\Omega/\Omega$ + 30 Ω 0.016 % + 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

Parameter/Equipment	Range	CMC ^{4, 5, 6} (±)	Comments
Resistance – Generate ³ 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 5720A
Insulation Resistance ³ – Fixed Points	10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ, 100 MΩ, 1 GΩ, 10 GΩ, 100 GΩ	1.2 %	Standard resistor set 100 Ω to 1 MΩ

Parameter/Range	Frequency	CMC ^{4, 5, 6} (±)	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 3.299 99) 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 5522 w/ scope option

Parameter/Range	Frequency	CMC ^{2, 4, 5, 6} (±)	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	

Parameter/Range	Frequency	CMC ^{2, 4, 5, 6} (±)	Comments
AC Voltage – Measure ³ (cont)			
(1 to 10) kV	60 Hz	0.013 % + 0.01 V	Vitrek 4670, Vitrek 4670 w/ HVL-70
(10 to 70) kV	60 Hz	0.013 % + 0.4 V	
AC Voltage – Generate ³			
(0.22 to 2.2) mV	(10 to 20) Hz	0.19 % + 4 μV	Fluke 5720
	(20 to 40) Hz	0.12 % + 4 μV	
	40 Hz to 20 kHz	0.086 % + 4 μV	
	(20 to 50) kHz	0.15 % + 4 μV	
	(50 to 100) kHz	0.21 % + 5 μV	
	(100 to 300) kHz	0.37 % + 10 μV	
	(300 to 500) kHz	0.53 % + 20 μV	
500 kHz to 1 MHz	0.69 % + 20 μV		
(2.2 to 22) mV	(10 to 20) Hz	0.031 % + 4 μV	
	(20 to 40) Hz	0.014 % + 4 μV	
	40 Hz to 20 kHz	0.013 % + 4 μV	
	(20 to 50) kHz	0.03 % + 4 μV	
	(50 to 100) kHz	0.066 % + 5 μV	
	(100 to 300) kHz	0.14 % + 10 μV	
	(300 to 500) kHz	0.18 % + 20 μV	
500 kHz to 1 MHz	0.35 % + 20 μV		
(22 to 220) mV	(10 to 20) Hz	0.03 % + 12 μV	
	(20 to 40) Hz	0.011 % + 7 μV	
	40 Hz to 20 kHz	0.01 % + 7 μV	
	(20 to 50) kHz	0.025 % + 7 μV	
	(50 to 100) kHz	0.056 % + 17 μV	
	(100 to 300) kHz	0.11 % + 20 μV	
	(300 to 500) kHz	0.17 % + 25 μV	
500 kHz to 1 MHz	0.34 % + 45 μV		
220 mV to 2.2 V	(10 to 20) Hz	0.62 % + 40 μV	
	(20 to 40) Hz	0.024 % + 15 μV	
	40 Hz to 20 kHz	56 μV/V + 8 μV	
	(20 to 50) kHz	93 μV/V + 10 μV	
	(50 to 100) kHz	0.014 % + 30 μV	
	(100 to 300) kHz	0.051 % + 80 μV	
	(300 to 500) kHz	0.012 % + 200 μV	
500 kHz to 1 MHz	0.021 % + 300 μV		

Parameter/Range	Frequency	CMC ^{2, 4, 5, 6} (±)	Comments
AC Voltage – Generate ³ (cont)			
(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 0.12 % + 150 μV 58 μV/V + 50 μV 95 μV/V + 100 μV 0.013 % + 200 μV 0.035 % + 600 μV 0.12 % + 2 mV 0.19 % + 3.2 mV	Fluke 5720
(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	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.037 % + 16 mV 58 μV/V + 3.5 mV	
AC Current – Measure ³			
(0 to 200) μA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.051 % + 0.02 μA 0.051 % + 0.02 μA 0.072 % + 0.02 μA 0.41 % + 0.02 μA	Fluke 8508A
(0.2 to 2) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.032 % + 0.2 μA 0.031 % + 0.2 μA 0.072 % + 0.2 μA 0.41 % + 0.2 μA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.032 % + 2 μA 0.031 % + 2 μA 0.072 % + 2 μA 0.41 % + 2 μA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.032 % + 0.02 mA 0.031 % + 0.02 mA 0.063 % + 0.02 mA	
(0.2 to 2) A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.063 % + 0.2 mA 0.074 % + 0.2 mA 0.31 % + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.083 % + 2 mA 0.26 % + 2 mA	

Parameter/Range	Frequency	CMC ^{2, 4, 5, 6} (±)	Comments
AC Current – Generate ³			
(10 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 0.020 % + 10 nA 0.014 % + 8 nA 0.029 % + 12 nA 0.14 % + 65 nA	Fluke 5720A
(33 to 330) µA	(10 to 30) kHz	2 % + 0.4 µA	Fluke 5522A
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 0.020 % + 35 nA 0.013 % + 35 nA 0.025 % + 110 nA 0.14 % + 650 nA	Fluke 5720A
(0.33 to 3.3) mA	(10 to 30) kHz	1.2 % + 0.6 µA	Fluke 5522A
(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 0.020 % + 350 nA 0.013 % + 350 nA 0.025 % + 550 nA 0.14 % + 5 µA	Fluke 5720A
(3.3 to 33) mA	(10 to 30) kHz	0.5 % + 4 µA	Fluke 5522A
(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 0.020 % + 3.5 µA 0.013 % + 2.5 µA 0.025 % + 3.5 µA 0.14 % + 10 µA	Fluke 5720A
(33 to 330) mA	(10 to 30) kHz	0.5 % + 200 µA	Fluke 5522A
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	Fluke 5720A
(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	
(11 to 20.5) A	45 Hz to 1 kHz	0.19 % + 5 mA	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 4, 5, 6} (\pm)	Comments
AC Clamp-On-Meters ³ – (10 to 150) A			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.025 A 1 % + 0.027 A	Fluke 5522A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.25 A 1.3 % + 0.25 A	Fluke 5522A w/ 5500 coil
(150 to 1025) A			
Toroidal	(45 to 65) Hz (65 to 440) Hz	0.49 % + 0.09 A 1 % + 0.1 A	Fluke 5522A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.9 A 1.3 % + 0.9 A	Fluke 5522A w/ 5500 coil
Oscilloscopes ³ –			
Square Wave Amplitude:			
50 Ω at 1 kHz	1.0 mV to 6.6 V _{pk-pk}	0.32 % + 40 μ V	Fluke 5522A SC1100
1 M Ω at 1 kHz	1.0 mV to 130 V _{pk-pk}	0.16 % + 40 μ V	
DC Voltage Amplitude:			
50 Ω Load	(0 to \pm 6.6) V	0.30 % + 40 μ V	
1 M Ω Load	(0 to \pm 130) V	0.07 % + 40 μ V	
Level Sine Wave:			
Frequency	Up to 1100 MHz	3.3 μ Hz/Hz	
Amplitude	50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.4 % + 300 μ V 4.4 % + 300 μ V 4.9 % + 300 μ V 7.3 % + 300 μ V 8.4 % + 300 μ V	

Parameter/Equipment	Range	CMC ^{2,6,9} (±)	Comments
Oscilloscopes ³ – (cont)			
Flatness (Bandwidth)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.1 % + 100 μV 2.6 % + 100 μV 4.9 % + 100 μV 6 % + 100 μV	Fluke 5522A SC1100
Time Markers:			
Into a 50 Ω load	5 s to 50 ms 20 ms to 2 ns	(30 + 1000 <i>t</i>) μs/s 3.5 μs/s	
Rise Time:			
1 kHz to 2 MHz	≤ 300 ps	130 ps	
(2 to 10) MHz	≤ 350 ps	130 ps	
Thermocouple Simulation ³ –			
Type E	(-250 to 1000) °C	0.15 °C	Fluke 5522A w/ ice point reference
Type J	(-210 to 1200) °C	0.15 °C	
Type K	(-200 to 1372) °C	0.16 °C	
Type R	(0 to 1767) °C	0.30 °C	
Type S	(0 to 1767) °C	0.29 °C	
Type T	(-250 to 400) °C	0.15 °C	
Electrical Calibration of RTD Indicators & Indicating Systems 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	0.07 °C 0.092 °C 0.11 °C 0.13 °C 0.15 °C 0.28 °C	Fluke 5522A

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 8, 10} (±)	Comments
Scales & Balances ³	(1 to 5) g	0.041 mg + 0.6R	ASTM Class 1 weights (applied load)
	Up to 10 g	0.06 mg + 0.6R	
	Up to 30 g	0.09 mg + 0.6R	
Up to 50 g	0.14 mg + 0.6R		
Up to 100 g	0.3 mg + 0.6R		
Up to 200 g	0.6 mg + 0.6R		
Up to 300 g	0.9 mg + 0.6R		
Up to 500 g	1.5 mg + 0.6R		
Up to 1000 g	3 mg + 0.6R		
	1 g to 20 kg (20 to 900) kg	0.017 % + 0.6R 0.017 % per 20 kg + 0.6R	
	Up to 1000 lb (1000 to 16 000) lb	0.017 % + 0.6R 0.017 % per 1000 lb + 0.6R	
Torque – Measuring Equipment (Wrenches) ³	5 in·lbf to 600 ft·lbf	0.65 %	CDI Suretest 5000-ST
Pressure ³ – Measuring Equipment	(-14.5 to 30) psi	0.07 % FS	Fluke 744 w/ 700 series pressure modules
	(10 to 100) psi	0.07 % FS	
	(50 to 500) psi	0.07 % FS	
	(100 to 1000) psi	0.04 % FS	Druck PM620-16G
	(1000 to 10 000) psi	0.1 % FS	Fluke 744 w/700 series module
	(3000 to 30 000) psi	0.13 % FS	Additel 681
Indirect Verification of Rockwell Hardness Testers ³	HRA Low Medium High	0.75 HRA 0.73 HRA 0.8 HRA	Indirect verification per ASTM E18
	HRBW Low Medium High	0.4 HRBW 0.45 HRBW 0.38 HRBW	

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ (cont)	HRC		Indirect verification per ASTM E18
	Low	0.43 HRC	
	Medium	0.43 HRC	
	High	0.38 HRC	
	HREW		
	Low	0.77 HREW	
	Medium	0.77 HREW	
	High	0.77 HREW	
	HR15N		
	Low	0.42 HR15N	
	Medium	0.42 HR15N	
	High	0.42 HR15N	
	HR30N		
	Low	0.58 HR30N	
	Medium	0.5 HR30N	
	High	0.6 HR30N	
	HR45N		
	Low	0.48 HR45N	
	Medium	0.48 HR45N	
	High	0.49 HR45N	
	HR15TW		
	Low	0.4 HR15TW	
	Medium	0.4 HR15TW	
	High	0.42 HR15TW	
HR30TW			
Low	0.41 HR30TW		
Medium	0.42 HR30TW		
High	0.42 HR30TW		
HR45TW			
Low	0.93 HR45TW		
Medium	0.5 HR45TW		
High	0.6 HR45TW		

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Humidity – Measuring Equipment	(20 to 80) % RH	1.5 %	Vaisala hygrometer w/ chamber
Humidity – Measure	(5 to 95) % RH	1.5 %	Vaisala hygrometer
Temperature – Measure ³	(-197 to 420) °C	0.065 °C	Fluke 1523 w/5615 PRT
Plate Temperature – Infrared Devices ³	Up to 100 °C Up to 200 °C Up to 350 °C Up to 500 °C	1 °C 1.2 °C 1.7 °C 2.3 °C	Fluke 4181
Temperature – Measuring Equipment ³	(-15 to 350) °C	0.15 °C	Temperature source w/ external probe

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Timers & Stopwatches ³	(1 to 3600) s	0.05 s	HP 53132A
Frequency – Measuring Equipment ³	0.01 Hz to 2 MHz Up to 1100 MHz	5.6 µHz/Hz + 5 µHz 3.3 µHz/Hz	Fluke 5522A Fluke 5522A w/ SC 1100 MHz scope option

¹ This laboratory offers commercial calibration and field calibration 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 Based on using the standard at the temperature the Fluke 5720A, Fluke 5520A was calibrated ($t_{cal} \pm 5$ °C) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 °C. For resistance, a zero calibration is performed at least every 12 hours within ± 1 °C of use.
- ⁵ Based on using the standard at the temperature the 8508A was calibrated ($t_{cal} \pm 5$ °C).
- ⁶ 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.
- ⁷ The statement of Calibration and Measurement Capability, L is the numerical value of the nominal length of the device measured in inches. In the Calibration and Measurement Capability, R is the numerical value of the resolution of the device. DL is the length of the diagonal in inches.
- ⁸ Unless otherwise noted, percentage refers to percent of reading.
- ⁹ In the statement of CMC, t represents the time in seconds.
- ¹⁰ 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.
- ¹¹ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

CROSS TECHNOLOGIES, INC DBA CROSS (FORMERLY J.A. KING)

Tulsa, OK

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 16th day of June 2021.

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

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.18
Valid to May 31, 2023

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