



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: May 31, 2024

Certificate Number: 1741.14

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
pH Meters ³	4 pH 7 pH 10 pH	0.04 pH 0.04 pH 0.05 pH	Standard pH solutions
Conductivity Meters ³	0.77 µS/cm 9.76 µS/cm 99.4 µS/cm 996 µS/cm	0.37 µS/cm 0.38 µS/cm 2.2 µS/cm 5.4 µS/cm	Standard conductivity solutions
Refractometers ³	(5, 15, 40, 70) % Brix	0.033 % Brix	Sucrose solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Pin Gage ³ – Class ZZ	Up to 1.0 in	80 µin	Micrometer
Calipers ³	Up to 60 in	(4.6 + 9.8L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range	CMC ^{2, 5} (\pm)	Comments
Micrometers ³	Up to 60 in	$(4.6 + 9.8L) \mu\text{in} + 0.6R$	Gage blocks
Linear Indicators ³ – Dial and Test	Up to 4 in	$(3 + 9.4L) \mu\text{in} + 0.6R$	Gage blocks
Height Gages ³	Up to 20 in (20 to 48) in	$(2.5 + 10L) \mu\text{in} + 0.6R$ $(9.5 + 9.7L) \mu\text{in} + 0.6R$	Gage blocks w/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 and Protractors ³	30°, 45°, 60°, 75°, 90°	0.03°	Angle block set
Feeler/Thickness Gages ³	Up to 1 in	80 μin	Micrometer
Coating Thickness Gages ³ – Film, Ultrasonic	Up to 60 mils	0.1 mils	Coating thickness standards
Optical Comparators ³			
Linear Accuracy	Up to 18 in	150 μin	Glass scale
Magnification	10x to 250x	0.014 in	Mag checker
Angle	(0 to 90)°	0.1°	Angle block set
Laser Micrometers ³	Up to 2 in	$(20 + 3.7L) \mu\text{in}$	Plug gages

Parameter/Equipment	Range	CMC ^{2,5} (\pm)	Comments
Surface Plates ³ — Grades AA, A, and B			
Repeatability	0.002 in	40 μ in	Repeat-o-meter
Flatness	Up to 60 <i>DL</i> in (>60 to 120) <i>DL</i> in	(31 + 0.2 <i>DL</i>) μ in (30 + 0.3 <i>DL</i>) μ in	Federal level system

III. Dimensional Inspection/Calibration⁸

Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
1D Length ³ – Measure	Up to 3 in Up to 6 in	0.000 14 in 0.0013 in	Micrometers Caliper

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	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 (1 to 10) kV (10 to 100) kV	7.8 μ V/V + 0.2 μ V 4.4 μ V/V + 0.3 μ V 4.4 μ V/V + 0.5 μ V 6.8 μ V/V + 30 μ V 7 μ V/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 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (100 to 1020) V	25 μ V/V + 1 μ V 14 μ V/V + 2 μ V 15 μ V/V + 15 μ V 22 μ V/V + 150 μ V 22 μ V/V + 1.5 mV	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
DC Current – Measure ³	(0 to 10) μ A (10 to 100) μ A (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 (1 to 1000) A	28 μ A/A + 0.4 nA 10 μ A/A + 0.4 nA 10 μ A/A + 4 nA 15 μ A/A + 40 nA 58 μ A/A + 1 μ A 0.014 % + 0.1mA 0.024 % + 0.4 mA 0.056 % + 4.4 mA 0.32 %	Fluke 8588A Empro shunt w/ fluke 8588A
DC Current – Generate ³	(0 to 330) μ A (0 to 3.3) mA (0 to 33) mA (0 to 330) mA (0 to 1.1) A (1.1 to 3) A (0 to 11) A (11 to 21) A	0.018 % + 0.02 μ A 0.012 % + 0.05 μ A 0.013 % + 0.25 μ A 0.015 % + 2.5 μ A 0.025 % + 40 μ A 0.046 % + 40 μ A 0.06 % + 500 μ A 0.12 % + 750 μ A	Fluke 5522A
DC Clamp-On Meters ³ – Non-Toroidal	Up 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	0.032 % 0.031 % 0.085 %	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Resistance – Measure ³	(0 to 1) Ω (1 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (0.1 to 1) G Ω (1 to 10) G Ω	19 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$ 11 $\mu\Omega/\Omega$ + 14 $\mu\Omega$ 9.6 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 9.4 $\mu\Omega/\Omega$ + 0.5 m Ω 9.4 $\mu\Omega/\Omega$ + 5.0 m Ω 9.6 $\mu\Omega/\Omega$ + 50 m Ω 11 $\mu\Omega/\Omega$ + 1 Ω 24 $\mu\Omega/\Omega$ + 100 Ω 0.013 % + 10 k Ω 0.14 % + 1 M Ω 0.14 % + 10 M Ω	Fluke 8588A
Resistance – Generate ³	Up 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 Ω 51 $\mu\Omega/\Omega$ + 0.0015 Ω 34 $\mu\Omega/\Omega$ + 0.0014 Ω 34 $\mu\Omega/\Omega$ + 0.002 Ω 34 $\mu\Omega/\Omega$ + 0.02 Ω 34 $\mu\Omega/\Omega$ + 0.2 Ω 39 $\mu\Omega/\Omega$ + 2 Ω 73 $\mu\Omega/\Omega$ + 30 Ω 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
Decade Steps	1 m Ω to 100 Ω	0.026 % + 1 m Ω	IET decade resistor 1433-19-K
Insulation Resistance – Generate ³			
Fixed Points	0.1 Ω , 1 Ω , 100 Ω , 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω , 10 M Ω , 100 M Ω , 1 G Ω 2 G Ω , 5 G Ω , 10 G Ω , 100 G Ω	1.2 %	Standard resistors

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
Capacitance – Generate ³	(3.3 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF 330 μF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.34 % + 0.01 nF 0.32 % + 0.1 nF 0.32 % + 0.3 nF 0.32 % + 1 nF 0.32 % + 3 nF 0.32 % + 10 nF 0.5 % + 30 nF 0.57 % + 100 nF 0.57 % + 300 nF 0.58 % + 300 nF 0.56 % + 3 μF 0.56 % + 10 μF 0.9 % + 30 μF 2.2 % + 100 μF	Fluke 5522A
Decade Steps	10 pF to 100 μF	1.3 %	Time Electronics 1071

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
Capacitance – Measure ³			
(0.1 to 1) nF	(50 to 60) Hz	0.23 % + 0.1 nF	Fluke 8588A
(1 to 10) nF	(50 to 60) Hz	0.13 % + 0.2 nF	
(10 to 100) nF	(50 to 60) Hz	0.1 % + 0.01 nF	
(0.1 to 1) μF	(50 to 60) Hz	0.1 % + 0.1 nF	
(1 to 10) μF	(50 to 60) Hz	0.1 % + 0.1 nF	
(10 to 100) μF	(50 to 60) Hz	0.11 % + 0.01 μF	
(0.1 to 1) mF	(50 to 60) Hz	0.11 % + 0.1 μF	
(1 to 10) mF	(50 to 60) Hz	0.12 % + 1 μF	
(10 to 100) mF	(50 to 60) Hz	0.12 % + 0.1 mF	
AC Voltage – Generate ³			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.1 % + 6 μV 0.021 % + 6 μV 0.027 % + 6 μV 0.12 % + 6 μV 0.42 % + 12 μV 0.96 % + 50 μV	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.036 % + 8 μV 0.018 % + 8 μV 0.02 % + 8 μV 0.042 % + 8 μV 0.096 % + 32 μV 0.24 % + 70 μV	Fluke 5522A
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.04 % + 50 μV 0.019 % + 60 μV 0.023 % + 60 μV 0.036 % + 50 μV 0.085 % + 130 μV 0.29 % + 600 μV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 650 μV 0.019 % + 600 μV 0.029 % + 600 μV 0.043 % + 600 μV 0.11 % + 1.6 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % + 2 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.038 % + 6 mV 0.25 % + 50 mV	
(330 to 1020) V	45 Hz to 10 kHz	0.037 % + 10 mV	
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 μV 0.041 % + 1.1 μV 0.042 % + 1.1 μV 0.031 % + 1.1 μV 1.1 % + 4 μV 2.1 % + 4 μV	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 μV 0.014 % + 0.4 μV 0.024 % + 1 μV 0.054 % + 5 μV 0.22 % + 30 μV 1.2 % + 0.1 mV	

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage – Measure ³ (cont)			
(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 μV 0.013 % + 5 μV 0.024 % + 10 μV 0.054 % + 50 μV 0.22 % + 0.3 mV 1.1 % + 1 mV	Fluke 8588A
(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 μV 0.013 % + 50 μV 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
Up to 10 kV	Up to 60 Hz	0.15 % + 0.1 V	Vitrek 4700 w/HVL-100
(10 to 70) kV	60 Hz	0.15 % + 0.6 V	
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 5522A w/ 5500 coil
Non-Toroidal	(45 to 65) Hz (65 to 440) Hz	0.76 % + 0.25 A 1.3 % + 0.25 A	

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Clamp-On Meters ³ – (cont)			
(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	
AC Current – Generate ³			
Up to 0.33 mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.25 % + 0.1 µA 0.18 % + 0.1 µA 0.16 % + 0.1 µA 0.37 % + 0.15 µA 0.97 % + 0.2 µA 1.9 % + 0.4 µA	Fluke 5522A
(0.33 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.24 % + 0.15 µA 0.15 % + 0.15 µA 0.13 % + 0.15 µA 0.25 % + 0.2 µA 0.6 % + 0.3 µA 1.2 % + 0.6 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.22 % + 2 µA 0.11 % + 2 µA 0.05 % + 2 µA 0.1 % + 2 µA 0.25 % + 3 µA 0.49 % + 4 µA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.22 % + 20 µA 0.11 % + 20 µA 0.05 % + 20 µA 0.13 % + 50 µA 0.25 % + 100 µA 0.49 % + 200 µA	
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.22 % + 100 µA 0.063 % + 100 µA 0.73 % + 1 mA 3 % + 5 mA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate ³ (cont)			
(1.1 to 3.0) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.22 % + 100 µA 0.08 % + 100 µA 0.73 % + 1 mA 3 % + 5 mA	Fluke 5522A
(3.0 to 11) A	45 Hz to 1 kHz (1 to 5) kHz	0.13 % + 2 mA 3.6 % + 2 mA	
(11 to 20.5) A	45 Hz to 1 kHz (1 to 5) kHz	0.19 % + 5 mA 3.6 % + 5 mA	
AC Current – Measure ³			
(0 to 10) µA	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	Fluke 8588A
(10 to 100) µA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 5 nA 0.054 % + 5 nA 0.075 % + 5 nA 0.41 % + 10 nA	
(0.1 to 1) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 50 nA 0.054 % + 50 nA 0.075 % + 50 nA 0.41 % + 0.1 µA	
(1 to 10) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 0.5 µA 0.054 % + 0.5 µA 0.075 % + 0.5 µA 0.41 % + 1 µA	
(10 to 100) mA	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.029 % + 5 µA 0.053 % + 5 µA 0.075 % + 5 µA	
(0.1 to 1) A	1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.031 % + 0.1 mA 0.056 % + 0.1 mA 0.08 % + 0.1 mA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	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 8588A
(10 to 30) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 12 mA 0.13 % + 12 mA	
(1 to 10) A	45 Hz to 1 kHz	0.97 % + 5 mA	Fluke 287
(1 to 100) A	@ 60 Hz	0.32 %	Empro shunt w/DMM

Parameter/Equipment	Range	CMC ^{2,4,6} (±)	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 %	
(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 %	
(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
Thermocouple Simulation ³ –			
Type B	(600 to 800) °C (800 to 1550) °C (1550 to 1820) °C	0.44 °C 0.36 °C 0.3 °C	Fluke 7526A
Type C	(0 to 1000) °C (1000 to 1800) °C (1800 to 2000) °C (2000 to 2316) °C	0.23 °C 0.31 °C 0.34 °C 0.44 °C	
Type E	(-250 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 600) °C (600 to 1000) °C	0.32 °C 0.18 °C 0.15 °C 0.14 °C 0.16 °C	
Type J	(-210 to -100) °C (-100 to 800) °C (800 to 1200) °C	0.2 °C 0.15 °C 0.16 °C	
Thermocouple Simulation ³ –			
Type K	(-250 to -200) °C (-200 to -100) °C (-100 to 500) °C (500 to 800) °C (800 to 1372) °C	0.56 °C 0.22 °C 0.16 °C 0.16 °C 0.19 °C	Fluke 7526A
Type N	(-250 to -200) °C (-200 to -100) °C (-100 to 0) °C (0 to 100) °C (100 to 800) °C (800 to 1300) °C	0.89 °C 0.31 °C 0.19 °C 0.17 °C 0.18 °C 0.19 °C	
Type R	(-50 to -25) °C (-25 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1600) °C (1600 to 1767) °C	0.67 °C 0.55 °C 0.48 °C 0.36 °C 0.29 °C 0.28 °C 0.26 °C 0.31 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Thermocouple Simulation ³ – (cont)			
Type S	(-50 to -25) °C (-25 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 1000) °C (1000 to 1600) °C (1600 to 1767) °C	0.63 °C 0.54 °C 0.48 °C 0.37 °C 0.31 °C 0.29 °C 0.3 °C 0.34 °C	Fluke 7526A
Type T	(-250 to -200) °C (-200 to 0) °C (0 to 200) °C (200 to 400) °C	0.44 °C 0.23 °C 0.17 °C 0.17 °C	
Electrical Simulation of RTDs ³			
Pt 385, 100 Ω	(-200 to 800) °C	0.07 °C	Fluke 7526A
Pt 3926, 100 Ω	(-200 to 630) °C	0.07 °C	
Pt 3916, 100 Ω	(-200 to 630) °C	0.07 °C	
Pt 385, 200 Ω	(-200 to 400) °C (400 to 630) °C	0.48 °C 0.61 °C	
Pt 385, 500 Ω	(-200 to 630) °C	0.21 °C	
Pt 385, 1000 Ω	(-200 to 630) °C	0.12 °C	
Ni 120, 120 Ω	(-80 to 260) °C	0.05 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.46 °C	
YSI 400	(15 to 50) °C	0.04 °C	

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
RTD – Measure ³			
Pt 385, 100 Ω	(-200 to 800) °C	0.06 °C	Fluke 7526A
Pt 3926, 100 Ω	(-200 to 630) °C	0.06 °C	
Pt 3916, 100 Ω	(-200 to 630) °C	0.06 °C	
Pt 385, 200 Ω	(-200 to 400) °C (400 to 630) °C	0.1 °C 0.12 °C	
Pt 385, 500Ω	(-200 to 630) °C	0.07 °C	
Pt 385, 1000Ω	(-200 to 630) °C	0.06 °C	
Ni 120, 120Ω	(-80 to 260) °C	0.04 °C	
Cu 427, 10Ω	(-100 to 260) °C	0.14 °C	
YSI 400	(15 to 50) °C	0.02 °C	
Oscilloscopes ³ –			
Square Wave Signal:			Fluke 5522A w/ SC1100
50 Ω Load @ 1 kHz	1 mV to 6.6 V _{pk - pk}	0.32 % + 40 μV	
1 MΩ Load @ 1 kHz	1 mV to 130 V _{pk - pk}	0.16 % + 40 μV	
DC Volt Amplitude:			
50 Ω Load	(0 to 6.6) V	0.3 % + 40 μV	
1 MΩ Load	(0 to 130) V	0.07 % + 40 μV	
Level Sine Wave:			
Frequency	5 kHz to 1100 MHz	3.3 μHz/Hz	

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Oscilloscopes ³ – (cont)			
Level Sine Wave:			
Amplitude	50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (300 to 1100) MHz	2.4 % + 300 μV 4.4 % + 300 μV 4.9 % + 300 μV 7.2 % + 300 μV 8.4 % + 300 μV	Fluke 5522A w/ SC1100
Flatness (Bandwidth)	0 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (300 to 1100) MHz	2.1 % + 100 μV 2.6 % + 100 μV 4.9 % + 100 μV 6.1 % + 100 μV	
Time Markers:			
Into a 50 Ω load	5 s to 50 ms 20 ms to 2 ns	(30 + 1000t) μs/s 3.5 μs/s	t = time in seconds
Rise Time:			
1 kHz to 2 MHz (2 to 10) MHz	≤ 300 ps ≤ 350 ps	130 ps 130 ps	

V. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Fume Hoods – Air Velocity Only ³	(25 to 200) ft/min	4.5 %	Anemometer
Viscosity Meters ³	Up to 16 000 cP 25 000 cP 32 000 cP	1.5 cP 90 cP 150 cP	Standard viscosity solution w/ bath
Flow Meters ³ – Totalizers	Up to 50 gallons	0.7 %	Gravimetric method

VI. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 6, 7} (±)	Comments
Force – Measure, Measuring Equipment ³	Up to 1000 lbf Up to 5 lbf Up to 100 lbf Up to 250 lbf Up to 500 lbf Up to 1000 lbf Up to 2500 lbf Up to 5000 lbf Up to 10 000 lbf Up to 20 000 lbf Up to 50 000 lbf	0.017 % + 0.6R 0.02 lbf 0.33 % I.V. 0.23 lbf 0.43 lbf 0.31 % I.V. 0.32 % I.V. 4.8 lbf 9 lbf 19 lbf 0.35 % I.V.	Class F weights Load cells w/ indicator; I.V. means indicated values
Scales and Balances ³	(1 to 20 000) g (>20 to 5000) kg Up to 1000 lb (1000 to 120 000) lb (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 Above 1000 g	0.017 % + 0.6R 0.017 % + 0.6R 0.017 % + 0.6R 0.017 % per 20 000 lb+ 0.6R 0.013 mg + 0.6R 0.043 mg + 0.6R 0.062 mg + 0.6R 0.092 mg + 0.6R 0.17 mg + 0.6R 0.31 mg + 0.6R 0.63 mg + 0.6R 0.93 mg + 0.6R 1.5 mg + 0.6R 3.1 mg + 0.6R 3.1 mg per 1000 g + 0.6R	Class F weights (applied load) Class 1 weights (applied load)
Torque – Torque Wrenches & Tools – Measure ³	5 lbf·in to 600 lbf·ft	0.65 %	CDI Suretest 5000-ST
Rotary Torque Tools– Measure ³	(0.02 to 2) N·m (0.5 to 5) N·m (1 to 10) N·m (2 to 20) N·m (0.75 to 75) N·m (18 to 180) N·m (50 to 500) N·m	0.026 N·m 0.065 N·m 0.13 N·m 0.26 N·m 0.98 N·m 2.4 N·m 6.5 N·m	Crane – torque star w/rotary transducers

Parameter/Equipment	Range	CMC ^{2, 6, 7} (\pm)	Comments
Torque – Measuring Equipment ³	Up to 250 lbf·ft	0.13 %	Class F weights & arms
Atmospheric Pressure (Vacuum Gages) ³	(0.01 to 28.5) in·Hg	0.056 in·Hg	Fluke 2700G-BG200K
Barometric Pressure ³	(0 to 30) psia	0.037 psia	Druck DPI 705
Pressure – Measuring, Measuring Equipment ³ –			
Pneumatic	Up to 30 psig	0.022 psi	Fluke 2700G-BG200K
	Up to 100 psig	0.035 psi	Heise PPM-2
	Up to 500 psig	0.13 psi	Fluke 2700G-BG3.5M
	Up to 1500 psig	0.53 psi	Heise PPM
Hydraulic	(0 to 3000) psig	0.8 psi	Fluke 2700G-G20M
	(0 to 5000) psig	1.3 psi	Fluke 2700G-G35M
	(5 to 10 000) psig	7 psi	Druck DPI-104-10K

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³	HRC:		Indirect verification per ASTM E18
	Low	0.92 HRC	
	Medium	0.92 HRC	
	High	0.92 HRC	
	HRBW:		
	Low	1.6 HRBW	
	Medium	1.2 HRBW	
	High	1 HRBW	
	HRA:		
	Low	0.82 HRA	
	Medium	0.81 HRA	
	High	0.81 HRA	
	HREW		
	Low	0.81 HREW	
	Medium	0.81 HREW	
	High	0.81 HREW	
	HR15N		
	Low	0.81 HR15N	
	Medium	0.81 HR15N	
	High	0.81 HR15N	
	HR30N		
	Low	0.82 HR30N	
	Medium	0.82 HR30N	
	High	0.82 HR30N	
HR45N			
Low	0.82 HR45N		
Medium	0.81 HR45N		
High	0.82 HR45N		
HR15TW			
Low	0.81 HR15TW		
Medium	0.81 HR15TW		
High	0.82 HR15TW		
HR30TW			
Low	0.82 HR30TW		
Medium	0.81 HR30TW		
High	0.81 HR30TW		

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ (cont)	HR45TW Low Medium High	0.81 HR45TW 0.81 HR45TW 0.81 HR45TW	Indirect verification per ASTM E18
Indirect Verification of Microindentation Hardness Testers ³ (Vickers)	(100 to 240) HV (240 to 600) HV	2.9 HV 11 HV	ASTM E92
Indirect Verification of Brinell Hardness Testers at Test Condition ³ – HBW 10/3000/15	(200 to 399) HBW (400 to 600) HBW	4.5 HBW 2.6 HBW	ASTM E10
Speed ³ – Optic/Non-Contact: RPM Totalizer/Rate Meters Contact: RPM Totalizer/Rate Meters Speed/RPM/Rate Simulation	(6 to 200 000) rpm (0.5 to 20 000) rpm (6 to 200 000) rpm	0.017 % 0.22 % 0.003%	Monarch PLT200 Monarch PLT200 w/ 10 cm wheel Agilent 33120A

VII. Optical Quantities

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Light Booths ³ – Illuminance – Measure Correlated Color Temperature (CCT) – Measure	(10 to 5000) Lux (1700 to 6500) K	2.7 % 83 K	Illuminance spectrophotometer

VIII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Relative Humidity – Measure	(10 to 90) % RH	1.2 % RH	Rotronic HC2A-SH
Temperature – Measure ³	(-200 to 200) °C (200 to 420) °C (420 to 660) °C	0.035 °C 0.081 °C 0.11 °C	Fluke 1523 w/ 5626 PRT probe
Temperature – Measuring Equipment ³	(30 to 420) °C (420 to 660) °C	0.65 °C 0.9 °C	Fluke 9144

IX. Time and Frequency

Parameter/Equipment	Range	CMC ^{2, 6, 7} (±)	Comments
Timers and Stopwatches ³	(1 to 3600) s	0.2 s	Stopwatch
Frequency – Generate ³	0.01 Hz to 2 MHz Up to 15 MHz	30 µHz/Hz + 5 µHz 0.003 %	Fluke 5500A HP 33120A
Frequency – Measure ³	0.1 Hz to 10 MHz (10 to 225) MHz 225 MHz to 3 GHz	67 µHz/Hz 0.45 µHz/Hz 0.26 µHz/Hz	HP53181A opt 010

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

² Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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 the 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 microinches. In the statement of the Range or the CMC, DL is the diagonal length of the device 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 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.
- ⁸ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

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

Calvert City, KY

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 31st day of March 2022.

A blue ink signature of a person, likely a representative of the Accreditation Council, written over a horizontal line.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1741.14
Valid to May 31, 2024

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