



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: September 30, 2025

Certificate Number: 1741.19

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1, 8</sup>:

I. Chemical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
pH Meters <sup>3</sup>	4 pH 7 pH 10 pH	0.033 pH 0.029 pH 0.031 pH	Standard pH solutions
Conductivity Meters <sup>3</sup>	10 µS/cm 100 µS/cm 1000 µS/cm 10 000 µS/cm	0.11 µS/cm 0.79 µS/cm 4.5 µS/cm 41 µS/cm	Standard conductivity solutions
Refractometers <sup>3</sup>	Up to 75 % Brix	0.033 % Brix	Sucrose solutions

II. Dimensional

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
Pin Gages <sup>3</sup> – Class ZZ	Up to 1 in	80 µin	Micrometer
Calipers <sup>3</sup>	Up to 60 in	(4.6 + 9.8L) µin + 0.6R	Gage blocks

Parameter/Equipment	Range <sup>5</sup>	CMC <sup>2, 5</sup> (±)	Comments
Micrometers <sup>3</sup>	Up to 60 in	$(4.6 + 9.8L) \mu\text{in} + 0.6R$	Gage blocks
Linear Indicators – Dial & Test <sup>3</sup>	Up to 4 in	$(3 + 9.4L) \mu\text{in} + 0.6R$	Gage blocks
Height Gages <sup>3</sup>	Up to 24 in (24 to 48) in	$(38 + 8.6L) \mu\text{in} + 0.6R$ $(38 + 9.2L) \mu\text{in} + 0.6R$	Gage blocks w/surface plate
Steel Rules <sup>3</sup>	Up to 72 in	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Tape Measures <sup>3</sup>	Up to 25 ft	$(1.5 + 10L) \mu\text{in} + 0.6R$	Gage blocks
Angle Indicators & Protractors <sup>3</sup>	30°, 45°, 60°, 75°, 90°	$0.03^\circ + 0.6R$	Angle block set
Feeler/Thickness Gages <sup>3</sup>	Up to 1 in	80 $\mu\text{in}$	Micrometer
Coating Thickness Gages – Film, Ultrasonic <sup>3</sup>	Up to 60 mils	0.1 mils	Coating thickness standards
Optical Comparators <sup>3</sup> – Linear Accuracy Magnification Angle	Up to 12 in 10x to 250x Up to 90 °	200 $\mu\text{in}$ 0.014 in 0.1°	Glass scale Mag checker Angle block set
Surface Plates Grades AA, A and B <sup>3</sup> – Repeatability Flatness	0.002 in Up to 60 <i>DL</i> in (>60 to 120) <i>DL</i> in	40 $\mu\text{in}$ $(31 + 0.2DL) \mu\text{in}$ $(30 + 0.3DL) \mu\text{in}$	Repeat-o-meter Federal level system

### III. Dimensional Testing/Calibration<sup>9</sup>

Parameter/Equipment	Range <sup>5</sup>	CMC <sup>2,7</sup> ( $\pm$ )	Comments
One Dimensional – Measure <sup>3</sup>	Up to 3 in	83 $\mu$ in	Micrometer
	Up to 6 in	0.0026 in	Caliper

### IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2,4,6</sup> ( $\pm$ )	Comments
DC Voltage – Measure <sup>3</sup>	(0 to 100) mV (0.1 to 1.0) V (1 to 10) V (10 to 100) V (100 to 1000) V	7.8 $\mu$ V/V + 0.2 $\mu$ V 3.4 $\mu$ V/V + 0.3 $\mu$ V 3.4 $\mu$ V/V + 0.5 $\mu$ V 4.7 $\mu$ V/V + 30 $\mu$ V 4.8 $\mu$ V/V + 0.5 mV	Fluke 8588A
	(100 to 10) kV (10 to 100) kV	0.03 % + 0.03 V 0.05 % + 0.3 V	Vitretek 4700 w/ HVL-100
DC Voltage – Generate <sup>3</sup>	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (100 to 1020) V	25 $\mu$ V/V + 1 $\mu$ V 14 $\mu$ V/V + 2 $\mu$ V 15 $\mu$ V/V + 15 $\mu$ V 22 $\mu$ V/V + 150 $\mu$ V 22 $\mu$ V/V + 1.5 mV	Fluke 5522A
DC Current – Measure <sup>3</sup>	(0 to 10) $\mu$ A (10 to 100) $\mu$ 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	29 $\mu$ A/A + 0.4 nA 10 $\mu$ A/A + 0.4 nA 10 $\mu$ A/A + 4 nA 15 $\mu$ A/A + 40 nA 58 $\mu$ A/A + 1 $\mu$ A 0.014 % + 0.1mA 0.024 % + 0.4 mA 0.056 % + 4.4 mA	Fluke 8588A
	(1 to 1000) A	0.32 %	Empro shunt w/ Fluke 8588A
DC Clamp-On Meters <sup>3</sup> –	Up to 1000 A	0.65 % + 0.5 A	Fluke 5522A w/5500 coil

Parameter/Equipment	Range	CMC <sup>2, 6, 7</sup> (±)	Comments
DC Current – Generate <sup>3</sup>	(0 to 330) $\mu$ 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 $\mu$ A 0.012 % + 0.05 $\mu$ A 0.013 % + 0.25 $\mu$ A 0.015 % + 2.5 $\mu$ A 0.025 % + 40 $\mu$ A 0.046 % + 40 $\mu$ A 0.06 % + 500 $\mu$ A 0.12 % + 750 $\mu$ A	Fluke 5522A
DC Power – Generate <sup>3</sup>  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
Resistance – Measure <sup>3</sup>	(0 to 1) $\Omega$ (1 to 10) $\Omega$ (10 to 100) $\Omega$ (0.1 to 1) k $\Omega$ (1 to 10) k $\Omega$ (10 to 100) k $\Omega$ (0.1 to 1) M $\Omega$ (1 to 10) M $\Omega$ (10 to 100) M $\Omega$ (0.1 to 1) G $\Omega$ (1 to 10) G $\Omega$	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 $\Omega$ 9.4 $\mu\Omega/\Omega$ + 5.0 m $\Omega$ 9.6 $\mu\Omega/\Omega$ + 50 m $\Omega$ 11 $\mu\Omega/\Omega$ + 1 $\Omega$ 24 $\mu\Omega/\Omega$ + 100 $\Omega$ 0.013 % + 10 k $\Omega$ 0.14 % + 1 M $\Omega$ 0.14 % + 10 M $\Omega$	Fluke 8588A
Resistance – Generate <sup>3</sup>	Up to 11 $\Omega$ (11 to 33) $\Omega$ (33 to 110) $\Omega$ 110 $\Omega$ to 1.1 k $\Omega$ (1.1 to 11) k $\Omega$ (11 to 110) k $\Omega$ 110 k $\Omega$ to 1.1 M $\Omega$ (1.1 to 3.3) M $\Omega$ (3.3 to 11) M $\Omega$ (11 to 33) M $\Omega$ (33 to 110) M $\Omega$ (110 to 330) M $\Omega$ (330 to 1100) M $\Omega$	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 $\Omega$ 0.03 % + 2.5 k $\Omega$ 0.06 % + 3 k $\Omega$ 0.36 % + 100 k $\Omega$ 1.8 % + 500 k $\Omega$	Fluke 5522A
Decade Steps	1 m $\Omega$ to 100 $\Omega$  100 $\Omega$ to 10 M $\Omega$  10 M $\Omega$ to 1 G $\Omega$	0.026 % + 1 m $\Omega$  0.13 %  1.2 %	IET decade resistor 1433-19-K  IET HRRS-F7-100  IET HRRS-F7-100

Parameter/Equipment	Range	CMC <sup>2, 4, 6</sup> (±)	Comments
Resistance – Generate <sup>3</sup> (cont)			
Decade Steps	(1 to 10) GΩ	1.2 %	IET HRRS-F2-100M-5kV
	(1 to 100) GΩ	1.3 %	IET HRRS-F2-1G-5kV
Insulation Resistance – Generate <sup>3</sup>			
Fixed Points	0.1 Ω, 1 Ω, 10 Ω, 50 Ω, 100 Ω, 500 Ω, 1 kΩ, 5 kΩ, 10 kΩ, 50 kΩ,  1 MΩ, 10 MΩ, 100 MΩ,  1 GΩ, 10 GΩ, 100 GΩ, 1 TΩ	1.3 %  1.3 %  1.3 %	Standard resistors

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
Capacitance – Generate <sup>3</sup>			
(220 to 399.9) pF	(10 to 10 000) Hz	0.88 % + 10 pF	Fluke 5522A
(0.4 to 1.0999) nF	(10 to 10 000) Hz	0.6 % + 0.01 nF	
(1.1 to 3.2999) nF	(10 to 3000) Hz	0.6 % + 0.01 nF	
(3.3 to 10.9999) nF	(10 to 1000) Hz	0.31 % + 0.1 nF	
(11 to 109.999) nF	(10 to 1000) Hz	0.31 % + 0.1 nF	
(110 to 329.999) nF	(10 to 1000) Hz	0.31 % + 0.3 nF	
(0.33 to 1.099 99) μF	(10 to 600) Hz	0.31 % + 1 nF	
(1.1 to 3.299 99) μF	(10 to 300) Hz	0.31 % + 3 nF	
(3.3 to 10.9999) μF	(10 to 150) Hz	0.31 % + 10 nF	
(11 to 32.9999) μF	(10 to 120) Hz	0.49 % + 30 nF	
(33 to 109.999) μF	(10 to 80) Hz	0.55 % + 100 nF	
(110 to 329.999) μF	(0 to 50) Hz	0.55 % + 300 nF	
(0.33 to 1.099 99) mF	(0 to 20) Hz	0.55 % + 1 μF	
(1.1 to 3.299 99) mF	(0 to 6) Hz	0.55 % + 3 μF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.56 % + 10 μF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.91 % + 30 μF	
(33 to 110) mF	(0 to 0.2) Hz	1.4 % + 100 μF	
Decade Steps	10 pF to 1 nF 1 nF to 100 μF	1.4 % + 5 pF 1.3 %	Time Electronics 1071

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup>			
(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
(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	
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	
Capacitance – Measure <sup>3</sup>			
(0.1 to 1) nF (1 to 10) nF (10 to 100) nF (0.1 to 1) μF (1 to 10) μF (10 to 100) μF (0.1 to 1) mF (1 to 10) mF (10 to 100) mF	(50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz (50 to 60) Hz	0.23 % + 0.1 nF 0.13 % + 0.2 nF 0.1 % + 0.01 nF 0.1 % + 0.1 nF 0.1 % + 0.1 nF 0.11 % + 0.01 μF 0.11 % + 0.1 μF 0.12 % + 1 μF 0.12 % + 0.1 mF	Fluke 8588A

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup>			
(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	
(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	
(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	
(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 <sup>2, 4</sup> (±)	Comments
AC Clamp-On Meters <sup>3</sup> – 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	
(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	
AC Current – Generate <sup>3</sup>			
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	



Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Current – Generate <sup>3</sup> (cont)			
(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	Fluke 5522A
(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	
(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 <sup>3</sup>			
(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	

Parameter/Range	Frequency	CMC <sup>2, 4, 6</sup> (±)	Comments
AC Current – Measure <sup>3</sup> (cont)			
(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	Fluke 8588A
(1 to 10) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 0.5 mA 0.085 % + 0.5 mA	
(10 to 30) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 12 mA 0.13 % + 12 mA	
(1 to 100) A	60 Hz	0.32 %	Empro shunt w/DMM
AC Power – Generate <sup>3</sup>			
(45 to 65) Hz; PF=1  (33 to 330) mV			
(3.3 to 8.99) mA (9 to 32.99) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 20.5) A	110 μW to 3 mW (3 to 11) mW (1.1 to 30) mW (3 to 110) mW (11 to 300) mW (30 to 730) mW 73 mW to 1.5 W 150 mW to 6.8 W	0.17 % 0.12 % 0.17 % 0.12 % 0.16 % 0.14 % 0.16 % 0.14 %	Fluke 5522A
(45 to 65) Hz; PF=1  330 mV to 1020 V			
(3.3 to 8.99) mA (9 to 32.99) mA (33 to 89.99) mA (90 to 329.99) mA (0.33 to 0.8999) A (0.9 to 2.1999) A (2.2 to 4.4999) A (4.5 to 20.5) A	1.1 mW to 9 W 3 mW to 33 W 11 mW to 90 W 30 mW to 330 W 110 mW to 900 W 300 mW to 2200 W 730 mW to 4500 W (1.5 to 20.9) kW	0.15 % 0.1 % 0.15 % 0.1 % 0.14 % 0.11 % 0.15 % 0.12 %	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Thermocouple Simulation <sup>3</sup> –			
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	
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	
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	
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	0.63 °C 0.54 °C 0.48 °C 0.37 °C 0.31 °C 0.29 °C	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Thermocouple Simulation <sup>3</sup> – (cont)			
Type S	(1000 to 1600) °C (1600 to 1767) °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 <sup>3</sup> –			
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	
RTD – Measure <sup>3</sup>			
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	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
RTD – Measure <sup>3</sup> (cont)			
Pt 385, 500 Ω	(-200 to 630) °C	0.07 °C	Fluke 7526A
Pt 385, 1000 Ω	(-200 to 630) °C	0.06 °C	
Ni 120, 120 Ω	(-80 to 260) °C	0.04 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.14 °C	
YSI 400	(15 to 50) °C	0.02 °C	
Oscilloscopes <sup>3</sup> –			
Square Wave Signal:			Fluke 5522A w/ SC1100
50 Ω Load @ 1 kHz	1 mV to 6.6 V <sub>pk - pk</sub>	0.32 % + 40 μV	
1 MΩ Load @ 1 kHz	1 mV to 130 V <sub>pk - pk</sub>	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	Up to 1100 MHz	3.3 μHz/Hz	
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	
Flatness (Bandwidth)	Up 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	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Oscilloscopes <sup>3</sup> – (cont)			
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	<i>t</i> = time in seconds
Rise Time:			
1 kHz to 2 MHz (2 to 10) MHz	≤ 300 ps ≤ 350 ps	130 ps 130 ps	Fluke 5522A w/ SC1100

#### V. Fluid Quantities

Parameter/Equipment	Range	CMC <sup>2,6</sup> (±)	Comments
Fume Hoods – Air Velocity Only <sup>3</sup>	(20 to 200) ft/min	4.5 %	Anemometer RCC-561
Flow Meters <sup>3</sup> – Totalizers	Up to 50 gallons	0.7 %	Gravimetric method
Viscosity Meters <sup>3</sup>	Up to 35 000 cP	0.7 %	Standard viscosity solution w/ bath

VI. Mechanical

Parameter/Equipment	Range	CMC <sup>2, 5, 6, 7</sup> ( $\pm$ )	Comments
Force – Measuring Equipment <sup>3</sup>	Up to 1000 lbf Up to 5 lbf (5 to 50) lbf (50 to 100) lbf (100 to 1000) lbf Up to 12 500 lbf (12 500 to 50 000) lbf	0.03 % + 0.6R 0.02 lbf 0.08 lbf 0.33 % 0.33 % 45 lbf 0.32 %	Class F weights  Load cells w/ indicator
Scales & Balances <sup>3</sup>	Up to 20 000 g Up to 1000 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 0.013 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
Torque – Measuring Equipment <sup>3</sup>  Wrenches & Screwdrivers	5 ozf·in to 600 lbf·ft	0.65 %	CDI Suretest 5000-ST

Parameter/Equipment	Range	CMC <sup>2, 6, 7</sup> (±)	Comments
Rotary Torque Tools <sup>3</sup>  Pneumatic, DC, Pulse	(0.56 to 1.12) N·m (1.12 to 5.6) N·m  (1 to 10) N·m (2 to 20) N·m (7.5 to 75) N·m (18 to 180) N·m (50 to 500) N·m	1.4 % 1.8 %  0.13 N·m 0.26 N·m 0.98 N·m 2.4 N·m 6.5 N·m	Mountz BMX50i w/PTT - 2000 & rundown adapters  Rotary transducers w/ display
Torque Testers <sup>3</sup>	Up to 250 lbf-ft	0.13 %	Class F weights & arms
Atmospheric Pressure Vacuum <sup>3</sup> – Measuring Equipment	(0.01 to 28.5) inHg	0.015 inHg	Heise ST-2H w/HQS series modules
Barometric Pressure – Measuring Equipment <sup>3</sup>	(0 to 17) psia	0.015 psia	Fluke 6270 w/ PM600 A700K & A7M modules
Pressure – Measuring Equipment <sup>3</sup>  Differential	(-0.25 to 0.25) in·H <sub>2</sub> O (-0.5 to 0.5) in·H <sub>2</sub> O (-7.5 to 7.5) in·H <sub>2</sub> O (-60 to 60) in·H <sub>2</sub> O	0.0019 in·H <sub>2</sub> O 0.002 in·H <sub>2</sub> O 0.012 in·H <sub>2</sub> O Greater of 0.016 % rdg or 0.0036 % Span	Heise ST-2H w/ HQS series modules  Fluke 6270 w/PM600 series modules
Pneumatic	(-12 to 100) psi (100 to 1000) psi  Up to 3000 psig	Greater of 0.016 % rdg or 0.0036 % Span  0.8 psi	Fluke 6270 w/ PM600 A700K & A7M modules  Fluke 2700G-G20M
Absolute	Up to 100 psig + atmospheric  (100 to 250) psig + atmospheric	0.015 psi  0.04 psi	Fluke 6270 w/ PM600 A700K & A7M modules



Parameter/Equipment	Range	CMC <sup>2, 7</sup> (±)	Comments	
Pressure – Measuring Equipment <sup>3</sup> (cont)	Absolute			
	(250 to 500) psig + atmospheric	0.06 psi	Fluke 6270 w/ PM600 A700K & A7M modules	
	(500 to 750) psig + atmospheric	0.09 psi		
	(750 to 1000) psig + atmospheric	0.12 psi		
	Hydraulic	Up to 1000 psig	0.26 psi	Fluke 2700G-BG7M
		(0 to 5000) psig	1.3 psi	Fluke 2700G-G35M Fluke 2700G-G70M Additel ADT681-05-GP15K-PSI-N
(5 to 10 000) psig (5 to 15 000) psig		2.5 psi 9.4 psi		
Indirect Verification of Rockwell Hardness Testers <sup>3</sup>	HRC:		Indirect verification per ASTM E18	
	Low	0.77 HRC		
	Medium	0.77 HRC		
	High	0.76 HRC		
	HRBW:			
	Low	0.9 HRBW		
	Medium	0.87 HRBW		
	High	0.81 HRBW		
	HRA:			
	Low	0.79 HRA		
	Medium	0.77 HRA		
	High	0.76 HRA		
	HREW:			
	Low	0.76 HREW		
	Medium	0.77 HREW		
High	0.76 HREW			
HR15N:				
Low	0.81 HR15N			
Medium	0.81 HR15N			
High	0.81 HR15N			

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Indirect Verification of Rockwell Hardness Testers <sup>3</sup> (cont)	HR30N: Low Medium High  HR45N: Low Medium High  HR15TW: Low Medium High  HR30TW: Low Medium High  HR45TW: Low Medium High	0.82 HR30N 0.82 HR30N 0.82 HR30N  0.82 HR45N 0.81 HR45N 0.82 HR45N  0.81 HR15TW 0.81 HR15TW 0.82 HR15TW  0.82 HR30TW 0.81 HR30TW 0.81 HR30TW  0.81 HR45TW 0.81 HR45TW 0.81 HR45TW	Indirect verification per ASTM E18
Indirect Verification of Vickers Hardness Testers <sup>3</sup>  Vickers < 1 kgf	HV: Low Mid High	2.9 HV 11 HV 11 HV	ASTM E384 w/ ASTM E92
Indirect Verification of Brinell Hardness Testers <sup>3</sup> –  HBW 10mm/3000kg	HBW: Low Medium High	4.5 HBW 4.5 HBW 2.6 HBW	ASTM E10

Parameter/Equipment	Range	CMC <sup>2, 5, 6, 7</sup> (±)	Comments
Speed – Measure <sup>3</sup>  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 Simulation <sup>3</sup>	(6 to 200 000) rpm	0.003 %	Agilent 33120A
Totalize Meters <sup>3</sup> –  Distance – Measure  Mechanical Counter/Totalizers	Up to 200 ft  Up to 999 999 counts	0.64 %  0.02 % + 0.6R	Monarch PLT200 w/ 10 cm wheel
Tensile Testers <sup>3</sup> –  Speed / Rate  Displacement	Up to 50 in/min  Up to 20 in	0.025 %  0.000 25 in	Timer and caliper  Gage blocks w/ indicator
Mass – Field Check Weight Comparison <sup>3</sup>  Load Fixtures, Hangers, Package & Check Weights	Up to 50 lbs	0.024 %	Scale w/ weights

## VII. Optical Quantities

Parameter/Equipment	Range	CMC <sup>2,6</sup> (±)	Comments
Light Booths <sup>3</sup> –			
Illuminance	Up to 6000 Lux	2.6 %	Illuminance spectrophotometer
Color Temperature (CCT)	(1700 to 6500) K	60 K	

## VIII. Rubber & Plastics Industry Specific Equipment

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Extrusion Plastometers <sup>3</sup> –			ASTM D1238
Cylinder Bore (Section 5.2)	(8 to 10) mm	0.0015 mm	Bore micrometer
Die Orifice (Section 5.3)	(0.992 to 2.1) mm	0.000 83 mm	Go/no-go pin gages
Piston Land (Foot) Diameter (Section 5.4)	Up to 30 mm	0.0015 mm	Micrometer
Piston Rod Diameter (Section 5.4)	Up to 30 mm	0.0015 mm	
Piston Land Foot Length (Section 5.4)	Up to 30 mm	0.0015 mm	
Die (Orifice) Length (Section 5.3)	Up to 30 mm	0.0015 mm	
Piston & Load Weight (Section 5.4)	Up to 5000 g	0.13 %	Bench scale w/weights
Temperature (Section 5.5)	(0 to 400) °C	0.08 °C	ASTM D1238: Digital thermometer
Timing Devices (Section 5.6)	(0 to 3600) s	0.2 s	Stopwatch

## IX. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2,7</sup> (±)	Comments
Relative Humidity – Measure <sup>3</sup>	(15 to 95) % RH	1.3 % RH	Rotronic HC2A-SH
Plate Temperature – Infrared Measuring Equipment <sup>3</sup>	35 °C (35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.84 °C 1 °C 1.2 °C 1.7 °C 2.3 °C	Fluke 4181
Temperature – Measure <sup>3</sup>	(-200 to 200) °C (200 to 420) °C  (420 to 660) °C	0.046 °C 0.063 °C  0.08 °C	Fluke 1523 w/ 5615 PRT probe  Fluke 1523 w/5609 PRT
Temperature – Measuring Equipment <sup>3</sup>	(-30 to 125) °C  (50 to 660) °C	0.087 °C  0.26 °C	Fluke 7103 micro bath w/ reference probe  Fluke 9144 w/reference probe
Ovens, Furnaces, Refrigerators, Freezers, Incubators, Environmental Chambers, Baths & Dry Blocks <sup>3,7</sup> –  System Accuracy Tests & Uniformity Surveys  Temperature	(-200 to 200) °C (200 to 420) °C (420 to 660) °C (660 to 950) °C (950 to 1100) °C (1100 to 1200) °C	0.046 °C 0.063 °C 0.1 °C 2.5 °C 3.0 °C 3.8 °C	Fluke 1524 w/ 5609 PRT Probe   Fluke 1524 w/ Isotech 935-14-91  Rotronic HC2A-SH
Humidity	(10 to 90) % RH	1.0 % RH	

X. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2, 6, 7</sup> ( $\pm$ )	Comments
Timers & Stopwatches <sup>3</sup>	(1 to 3600) s	0.2 s	Stopwatch
Frequency – Measuring Equipment <sup>3</sup>	0.01 Hz to 2 MHz Up to 15 MHz	5.6 $\mu$ Hz/Hz + 5 $\mu$ Hz 0.003 %	Fluke 5522A HP 33120A
Frequency – Measure <sup>3</sup>	Up to 3 GHz	0.33 $\mu$ Hz/Hz	Agilent 53181A

<sup>1</sup> This laboratory offers commercial calibration and field calibration services, where noted.

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> 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.

<sup>5</sup> 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 the statement of the Range or the CMC,  $DL$  is the diagonal length of the device in inches.

<sup>6</sup> In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.

<sup>7</sup> 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.

<sup>8</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.

<sup>9</sup> 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.



# Accredited Laboratory

A2LA has accredited

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

*Louisville, 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 15<sup>th</sup> day of November 2023.

A blue ink signature of Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 1741.19  
Valid to September 30, 2025  
Revised May 22, 2024

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