



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: February 28, 2027

Certificate Number: 2332.02

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations^{1,5}:

I. Chemical Quantities

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
pH Meters – Measuring Equipment	4 pH 7 pH 10 pH	0.02 pH 0.02 pH 0.02 pH	Reference pH solutions, thermometer

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Force Measurement Test Stands			
Length	(1 to 8) in (8 to 20) in	63 µin/in + 1200 µin 0.006 in	Grade AS2 or better gage blocks
Crosshead Speed	(0.005 to 20) in/min	0.24 % + 0.004 in/min	Steel rule, stopwatch

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Pins, Plug Gages, & Master Disk	Up to 20 in	2.3 $\mu\text{in/in} + 12 \mu\text{in}$	LMU1000A
Micrometers ³	Up to 1 in (1 to 4) in (4 to 24) in (24 to 40) in	4.0 $\mu\text{in/in} + 10 \mu\text{in}$ 2.9 $\mu\text{in/in} + 43 \mu\text{in}$ 2.9 $\mu\text{in/in} + 77 \mu\text{in}$ 1.8 $\mu\text{in/in} + 400 \mu\text{in}$	Gage blocks
Calipers ³	Up to 24 in (24 to 40) in	0.7 $\mu\text{in/in} + 430 \mu\text{in}$ 11 $\mu\text{in/in} + 340 \mu\text{in}$	Gage blocks
Indicators	Up to 2 in	46 μin	Gage blocks
Height Gages	Up to 48 in	7.3 $\mu\text{in/in} + 50 \mu\text{in}$	Gage blocks
End Rods	Up to 20 in (20 to 40) in	2 $\mu\text{in/in} + 16 \mu\text{in}$ 2 $\mu\text{in/in} + 32 \mu\text{in}$	LMU1000A
Optical Comparators ³ – X/Y Linear Accuracy Angle X/Y Perpendicularity Magnification	Up to 12 in 30 in chart (in decimal degree) Up to 3 in Up to 30 in chart	(76 + 2.8L) μin 0.022° 80 μin 0.003 in	Max Levy glass grid
Measuring Microscopes – X-Y Axis	Up to 12 in	3 $\mu\text{in/in} + 65 \mu\text{in}$	6 x 12 glass grid

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Video Measuring Systems ³ – X-Y Axis Z Axis	Up to 12 in Up to 18 in Up to 24 in Up to 4 in	3.7 $\mu\text{in/in}$ + 34 μin 5.2 $\mu\text{in/in}$ + 27 μin 5.1 $\mu\text{in/in}$ + 34 μin 13 $\mu\text{in/in}$ + 33 μin	6 x 12 glass grid 18 x 18 glass grid 18 x 24 glass grid Gage blocks
Ring Gages	(0.125 to 0.25) in (0.25 to 1) in (1 to 3) in (3 to 7) in	11 μin 5.4 $\mu\text{in/in}$ + 9.8 μin 1.0 $\mu\text{in/in}$ + 15 μin 1.3 $\mu\text{in/in}$ + 15 μin	LMU1000A
Coating Thickness Gages	Up to 60 mils	0.13 % + 0.14 mils	Thickness standards
Surface Plates Grade AA, A, & B ³ – Flatness Repeat Reading	Up to 192 in <i>DL</i> Up to 0.002 in	4.6 μin + 0.8 $\mu\text{in/in}$ 24 μin	LDDM laser <i>DL</i> = diagonal length Repeat-o-meter
Surface Roughness Meters & Profilometer	(119.0 to 121.0) μin Ra	2.1 μin	Roughness specimen
Gage Blocks	(0.05 to 1) in (1 to 4) in (4 to 20) in	2.4 $\mu\text{in/in}$ + 2.8 μin 2.4 $\mu\text{in/in}$ + 1.7 μin 4 $\mu\text{in/in}$ + 0.2 μin	LMU1000A, master gage blocks
Thread Plugs Pitch Diameter Major Diameter	Up to 8 in Up to 12 in	96 μin 2 $\mu\text{in/in}$ + 56 μin	LMU1000A, master gage blocks, thread wires

III. Electrical DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
DC Voltage ³ – Generate	(0 to 329.9999) mV (0 to 3.299 999) V (0 to 32.999 99) V (30 to 329.9999) V (100 to 1020) V	20 nV/mV + 1000 nV 11 μ V/V + 2 μ V 12 μ V/V + 20 μ V 18 μ V/V + 160 μ V 18 μ V/V + 1500 μ V	5520A
DC Voltage ³ – Measure	(0 to 120) mV (0 to 1.2) V (0 to 12) V (0 to 120) V (0 to 1050) V (0 to 10) kV (10 to 35) kV (35 to 70) kV (70 to 90) kV	6.4 nV/mV + 530 nV 5.2 μ V/V + 0.53 μ V 5.2 μ V/V + 1.4 μ V 7.4 μ V/V + 53 μ V 23 μ V/V + 330 μ V 0.05 % + 0.006 V 0.07 % + 0.06 V 0.12 % + 0.06 V 0.28 % + 0.06 V	3458A Vitrek 4700 Vitrek HVL-35 Vitrek HVL-70 Vitrek HVL-150
DC Current ³ – Generate	(0 to 329.999) μ A (0 to 3.299 99) mA (0 to 32.9999) mA (0 to 329.999) mA (0 to 1.099 99) A (1.1 to 2.999 99) A (0 to 10.9999) A (11 to 20.5) A	0.015 % + 20 nA 0.01 % + 0.05 μ A 0.01 % + 0.25 μ A 0.01 % + 2.5 μ A 0.02 % + 0.04 mA 0.039 % + 0.032 mA 0.051 % + 0.5 mA 0.095 % + 1.6 mA	5520A
Clamp-On Meter	(20 to 1000) A	0.3 % + 0.68 A	Fluke 55xx w/50 turn coil
DC Current ³ – Measure	(0 to 120) nA (0 to 1.2) μ A (0 to 12) μ A (0 to 120) μ A (0 to 1.2) mA (0 to 12) mA (0 to 120) mA (0 to 1.05) A	0.033 pA/nA + 52 pA 0.024 nA/ μ A + 0.052 nA 0.026 nA/ μ A + 0.087 nA 0.027 nA/ μ A + 0.76 nA 0.025 μ A/mA + 0.0053 μ A 0.026 μ A/mA + 0.053 μ A 0.046 μ A/mA + 0.54 μ A 0.13 mA/A + 0.012 mA	3458A

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Resistance ³ – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (0.33 to 1.099 999) k Ω (1.1 to 3.299 999) k Ω (3.3 to 10.999 99) k Ω (11 to 32.999 99) k Ω (33 to 109.9999) k Ω (110 to 329.9999) k Ω (0.33 to 1.099 999) M Ω (1.1 to 3.299 999) M Ω (3.3 to 10.999 99) M Ω (11 to 32.999 99) M Ω (33 to 109.9999) M Ω (110 to 329.999) M Ω (330 to 1100) M Ω	45 $\mu\Omega/\Omega$ + 1000 $\mu\Omega$ 32 $\mu\Omega/\Omega$ + 1400 $\mu\Omega$ 29 $\mu\Omega/\Omega$ + 1400 $\mu\Omega$ 27 $\mu\Omega/\Omega$ + 2100 $\mu\Omega$ 29 m Ω /k Ω + 1.6 m Ω 27 m Ω /k Ω + 21 m Ω 29 m Ω /k Ω + 16 m Ω 27 m Ω /k Ω + 210 m Ω 29 m Ω /k Ω + 160 m Ω 33 m Ω /k Ω + 2000 m Ω 32 Ω /M Ω + 2.3 Ω 60 Ω /M Ω + 30 Ω 130 Ω /M Ω + 43 Ω 250 Ω /M Ω + 2600 Ω 520 Ω /M Ω + 2900 Ω 3000 Ω /M Ω + 110 000 Ω 15 000 Ω /M Ω + 570 000 Ω	Fluke 5520
Resistance ³ – Generate, Fixed Points	1.0 m Ω 10.0 m Ω 100.0 m Ω 1.0 Ω 10.0 Ω 100.0 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1 G Ω 10 G Ω 100 G Ω	0.000 25 m Ω 0.0025 m Ω 0.025 m Ω 0.000 25 Ω 0.0025 Ω 0.025 Ω 24 m Ω 240 m Ω 2.4 Ω 30 Ω 330 Ω 24 k Ω 7.1 M Ω 56 M Ω 1.1 G Ω	Fixed standard resistors

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Resistance ³ – Measure	(0 to 12) Ω (0 to 120) Ω (0 to 1.2) k Ω (0 to 12) k Ω (0 to 120) k Ω (0 to 1.2) M Ω (0 to 12) M Ω (0 to 120) M Ω (0 to 1.2) G Ω	18 $\mu\Omega/\Omega$ + 70 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 700 $\mu\Omega$ 12 m Ω /k Ω + 2.4 m Ω 12 m Ω /k Ω + 24 m Ω 12 m Ω /k Ω + 240 m Ω 18 Ω /M Ω + 3.3 Ω 61 Ω /M Ω + 120 Ω 610 Ω /M Ω + 2100 Ω 5700 k Ω /G Ω + 110 k Ω	Agilent 3458A
Electrical Simulation of RTDs ³ –			
Pt 385, 100 Ω	(-200 to -80) $^{\circ}\text{C}$ (-80 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 630) $^{\circ}\text{C}$ (630 to 800) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.09 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	Fluke 5522A
Pt 3926, 100 Ω	(-200 to -80) $^{\circ}\text{C}$ (-80 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 630) $^{\circ}\text{C}$	0.08 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.1 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$	
Pt 3916, 100 Ω	(-200 to -190) $^{\circ}\text{C}$ (-190 to -80) $^{\circ}\text{C}$ (-80 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$ (260 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.26 $^{\circ}\text{C}$ 0.07 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.09 $^{\circ}\text{C}$ 0.1 $^{\circ}\text{C}$ 0.1 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.24 $^{\circ}\text{C}$	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTDs ³ – (cont)			
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.07 °C 0.07 °C 0.07 °C 0.08 °C 0.17 °C 0.16 °C 0.16 °C 0.19 °C	Fluke 5522A
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.07 °C 0.08 °C 0.08 °C 0.09 °C 0.1 °C 0.1 °C 0.11 °C 0.13 °C	
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.07 °C 0.07 °C 0.07 °C 0.08 °C 0.09 °C 0.09 °C 0.09 °C 0.24 °C	
Ni 120, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.1 °C 0.1 °C 0.15 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.32 °C	
Electrical Simulation of Thermocouples ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.45 °C 0.34 °C 0.30 °C 0.34 °C	Fluke 5522A

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouples ³ – (cont)			
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.31 °C 0.26 °C 0.31 °C 0.50 °C 0.84 °C	Fluke 5522A
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.51 °C 0.19 °C 0.17 °C 0.18 °C 0.23 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.19 °C 0.16 °C 0.18 °C 0.24 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.35 °C 0.21 °C 0.19 °C 0.29 °C 0.41 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.40 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.59 °C 0.37 °C 0.35 °C 0.48 °C	
Type S	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.49 °C 0.38 °C 0.39 °C 0.48 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.64 °C 0.26 °C 0.19 °C 0.17 °C	

Parameter/Range	Frequency	CMC ^{2, 7} (±)	Comments
AC Voltage ³ – Generate			
(1.0 to 32.999) mV	(10 to 45) Hz (0.045 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.079 % + 6 µV 0.015 % + 6 µV 0.021 % + 6.1 µV 0.1 % + 6.1 µV 0.36 % + 12 µV 0.79 % + 50 µV	Fluke 5522A
(33 to 329.999) mV	(10 to 45) Hz (0.045 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.031 % + 7.8 µV 0.014 % + 8.2 µV 0.016 % + 8.8 µV 0.034 % + 8.9 µV 0.081 % + 32 µV 0.2 % + 74 µV	
(0.33 to 3.299 99) V	(10 to 45) Hz (0.045 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.029 % + 0.056 mV 0.015 % + 0.06 mV 0.019 % + 0.068 mV 0.029 % + 0.056 mV 0.069 % + 0.13 mV 0.24 % + 0.6 mV	
(3.3 to 32.9999) V	(10 to 45) Hz (0.045 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.031 % + 0.67 mV 0.015 % + 0.6 mV 0.024 % + 0.6 mV 0.034 % + 0.67 mV 0.089 % + 1.7 mV	
(33 to 329.999) V	(45 to 1000) Hz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.019 % + 2.2 mV 0.02 % + 6.4 mV 0.025 % + 5.7 mV 0.032 % + 5.6 mV 0.2 % + 54 mV	
(330 to 1020) V	(45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.03 % + 9.6 mV 0.026 % + 9.8 mV 0.03 % + 9.6 mV	

Parameter/Range	Frequency	CMC ^{2, 7} (±)	Comments
AC Voltage ³ – Measure			
(1.2 to 12) mV	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.036 % + 3.5 µV 0.024 % + 1.3 µV 0.036 % + 1.3 µV 0.12 % + 1.2 µV 0.58 % + 1.3 µV 4.6 % + 2.2 µV	Agilent 3458A
(12 to 120) mV	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz (1 to 2) MHz	0.0096 % + 4.4 µV 0.009 % + 2.2 µV 0.017 % + 2.2 µV 0.041 % + 2.1 µV 0.098 % + 2.2 µV 0.35 % + 12 µV 1.2 % + 11 µV 1.7 % + 11 µV	
(0.12 to 1.2) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz (1 to 2) MHz	0.0096 % + 0.044 mV 0.009 % + 0.022 mV 0.065 % + 0.0089 mV 0.037 % + 0.022 mV 0.098 % + 0.022 mV 0.35 % + 0.12 mV 1.2 % + 0.11 mV 1.7 % + 0.11 mV	
(1.2 to 12) V	(1 to 40) Hz (40 to 100) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz (1 to 2) MHz	0.0096 % + 0.44 mV 0.009 % + 0.22 mV 0.017 % + 0.22 mV 0.036 % + 0.22 mV 0.089 % + 0.33 mV 0.35 % + 1.1 mV 1.2 % + 1.1 mV 1.7 % + 1.1 mV	
(12 to 120) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.024 % + 4.6 mV 0.023 % + 2.3 mV 0.024 % + 2.3 mV 0.041 % + 2.2 mV 0.14 % + 2.2 mV 0.47 % + 11 mV 1.7 % + 11 mV	

Parameter/Range	Frequency	CMC ^{2, 7} (±)	Comments
AC Voltage ³ – Measure (cont)			
(70 to 700) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.048 % + 46 mV 0.047 % + 23 mV 0.07 % + 23 mV 0.14 % + 23 mV 0.35 % + 22 mV	Agilent 3458A
Up to 10 kV (10 to 30) kV (30 to 50) kV (50 to 70) kV	(30 to 200) Hz (30 to 200) Hz (30 to 100) Hz < 65 Hz	0.16 % + 0.006 V 0.14 % + 0.06 V 0.16 % + 0.06 V 0.69 % + 0.06 V	Vitrek 4700 Vitrek HVL-35 Vitrek HVL-70 Vitrek HVL-150
AC Current ³ – Generate			
(29 to 329.99) µA	(10 to 20) Hz (20 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 75 nA 0.12 % + 76 nA 0.096 % + 82 nA 0.24 % + 110 nA 0.62 % + 160 nA 1.2 % + 310 nA	Fluke 5522A
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.15 % + 0.12 µA 0.096 % + 0.12 µA 0.078 % + 0.13 µA 0.16 % + 0.17 µA 0.39 % + 0.22 µA 0.77 % + 0.44 µA	
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 1.6 µA 0.071 % + 1.6 µA 0.031 % + 1.7 µA 0.062 % + 1.7 µA 0.16 % + 2.3 µA 0.33 % + 2.2 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 16 µA 0.071 % + 16 µA 0.031 % + 17 µA 0.079 % + 39 µA 0.15 % + 79 µA 0.32 % + 160 µA	

Parameter/Range	Frequency	CMC ^{2, 7, 8} ($\pm$)	Comments
AC Current ³ – Generate			
(0.33 to 1.099 99) A	(10 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.14 % + 0.086 mA 0.039 % + 0.081 mA 0.47 % + 0.76 mA 1.9 % + 3.6 mA	Fluke 5522A
(1.1 to 2.999 99) A	(10 to 45) Hz (45 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.14 % + 0.037 mA 0.047 % + 0.079 mA 0.48 % + 0.63 mA 1.9 % + 3.6 mA	
(3 to 10.9999) A	(10 to 45) Hz (45 to 1000) Hz (1 to 5) kHz	0.048 % + 1.6 mA 0.076 % + 1.6 mA 2.4 % + 1.5 mA	
(11 to 20.5) A	(10 to 45) Hz (45 to 1000) Hz (1 to 5) kHz	0.095 % + 3.6 mA 0.12 % + 4.3 mA 2.3 % + 5.3 mA	
Clamp Meters: (20 to 1000) A	(45 to 65) Hz	0.34 % of IV + 0.72 A	Fluke 5500/coil
AC Current ³ – Measure			
(6 to 120) μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.47 % + 35 nA 0.18 % + 35 nA 0.071 % + 35 nA 0.071 % + 35 nA	Agilent 3458A
(0.06 to 1.2) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 0.24 μ A 0.18 % + 0.23 μ A 0.072 % + 0.24 μ A 0.035 % + 0.24 μ A 0.072 % + 0.24 μ A 0.48 % + 0.46 μ A 0.66 % + 1.7 μ A	
(0.6 to 12) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 2.4 μ A 0.18 % + 2.3 μ A 0.072 % + 2.4 μ A 0.035 % + 2.4 μ A 0.072 % + 2.4 μ A 0.48 % + 4.6 μ A 0.66 % + 17 μ A	

Parameter/Range	Frequency	CMC ^{2, 7} (±)	Comments
AC Current ³ – Measure (cont)			
(6 to 120) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 24 µA 0.18 % + 23 µA 0.072 % + 24 µA 0.035 % + 24 µA 0.072 % + 24 µA 0.48 % + 46 µA 0.66 % + 170 µA	Agilent 3458A
(0.0525 to 1.05) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz (5 to 20) kHz (20 to 50) kHz	0.47 % + 0.23 mA 0.19 % + 0.23 mA 0.092 % + 0.23 mA 0.12 % + 0.24 mA 0.35 % + 0.24 mA 1.2 % + 0.47 mA	
Capacitance ³ – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.5 % + 0.01 nF	
(3.3 to 10.999) nF	10 Hz to 1 kHz	0.25 % + 0.01 nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.25 % + 0.1 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.25 % + 0.3 nF	
(0.33 to 1.099 99) µF	(10 to 600) Hz	0.25 % + 1.0 nF	
(1.1 to 3.299 99) µF	(10 to 300) Hz	0.25 % + 3.0 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	0.25 % + 10 nF	
(11 to 32.9999) µF	(10 to 120) Hz	0.4 % + 30 nF	
(33 to 109.999) µF	(10 to 80) Hz	0.45 % + 100 nF	
(110 to 329.999) µF	(10 to 50) Hz	0.45 % + 300 nF	
(0.33 to 1.0999) mF	(0 to 20) Hz	0.45 % + 1.0 µF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.45 % + 3.0 µF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.45 % + 10 µF	
(11 to 32.999) mF	(0 to 0.6) Hz	0.75 % + 30 µF	
(33 to 110) mF	(0 to 0.2) Hz	1.1 % + 100 µF	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Oscilloscope ³ –			
Amplitude – 50 Ω Load 1 MΩ Load	(-6.6 to 6.6) V (-130 to 130) V	0.25 % + 40 μV 0.05 % + 40 μV	Fluke 55xx/SC
Leveled Sine Wave Amplitude – 5 mV to 5.5 V	50 kHz Reference: 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 300 μV 3.5 % + 300 μV 4.0 % + 300 μV 6.0 % + 300 μV	
5 mV to 3.5 V			
Flatness – Relative to 50 kHz 5 mV to 5.5 V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.5 % + 100 μV 2.0 % + 100 μV 4.0 % + 100 μV 5.0 % + 100 μV	
5 mV to 3.5 V			
Time Marker – 50 Ω Load	5 s to 50 ms 20 ms to 1 ns	(25 + 1000 <i>t</i>) μs/s 2.5 μs/s	<i>t</i> is the time in seconds
Edge – Rise Time 50 Ω Load	1 kHz to 2 MHz (200 to 300) ps	100 ps	At cardinal point sequence 5-2-1
	2 MHz to 10 MHz (200 to 350) ps	100 ps	

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 6} ($\pm$)	Comments
Pressure – Measuring Equipment			
Pneumatic, Absolute	(0.15 to 14.7) psia (14.7 to 15.7) psia (15.7 to 21.1) psia (21.1 to 22.7) psia (22.7 to 30.7) psia	0.0025 psia 0.0018 psia 0.0011 psia + 0.0039 psia 0.002 psia + 0.000 22 psia 0.007 % + 0.000 37 psia	Mensor CPC6000
Pneumatic	(0 to 8) psi (8 to 1500) psi	0.012 % + 0.000 004 psi (0.012 %) psi	
Vacuum	(-15 to 0) psi (-1 to 0) psi	0.002 psi 0.000 12 psi	Mensor CPC6000
Hydraulic	(10 to 10 000) psi	(0.023 % + 0.003) psi	SI 9250-4
Balance & Scales ³	Up to 30 kg Up to 500 lb	0.000 26 % + 0.038 mg 0.015 % + 0.000 05 lb	Class 1 weight Class F weight
Force Gauges	Up to 200 lbf	± 0.01 % + 0.002 lbf	Direct comparison to ASTM Class 6 & 7 weights
Load Cells	Up to 25 lbf (26 to 250) lbf (251 to 1150) lbf Up to 25 lbf (26 to 250) lbf (251 to 1150) lbf (1101 to 2500) lbf (2501 to 11 500) lbf (10 001 to 50 000) lbf (50 001 to 100 000) lbf	0.021 lbf 0.10 lbf 0.48 lbf 0.021 lbf 0.10 lbf 0.48 lbf 1.1 lbf 4.3 lbf 30 lbf 63 lbf	Load cells tension & compression Load cells tension & compression Compression only

Parameter/Equipment	Range	CMC ^{2, 4, 6} (±)	Comments
Torque ³ – Measuring Equipment	(4 to 50) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft	0.25 % + 0.023 lbf·in 0.25 % + 0.24 lbf·in 0.27 % + 0.27 lbf·in 0.27 % + 0.067 lbf·ft 0.6 %	Snap-On TTC400 system Snap-On TTC12
Torque Analyzers, Transducers	(2.5 to 50) lbf·in (10 to 150) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (20 to 250) lbf·ft	0.05 % + 0.012 lbf·in 0.04 % + 0.011 lbf·in 0.04 % + 0.013 lbf·in 0.04 % + 0.14 lbf·in 0.04 % + 0.018 lbf·ft	5 in wheel (ADD) 5 in wheel 20 in wheel 20 in wheel 20 in wheel ASTM Class 6 Weights
Mass Standards	1 mg to 220 g (220 to 6200) g (6.2 to 35) kg	0.0005 % + 0.03 mg 0.0005 % + 10 mg 0.0019 % + 120 mg	Ohaus EX225/AD, A&D GF-6100, Ohaus EX35001 direct comparison to weights Class 1,2, F1
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers	HRBW: (40 to 59) HRBW (59 to 79) HRBW (79 to 100) HRBW HRC: (20 to 35) HRC (35 to 55) HRC (55 to 65) HRC HR15N: (70 to 77) HR15N (77 to 88) HR15N (88 to 92) HR15N HR30N: (40 to 54) HR30N (54 to 76) HR30N (76 to 86) HR30N	0.81 HRBW 0.72 HRBW 0.62 HRBW 0.44 HRC 0.42 HRC 0.40 HRC 0.53 HR15N 0.38 HR15N 0.36 HR15N 0.36 HR30N 0.36 HR30N 0.37 HR30N	Rockwell hardness test blocks

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Indirect Verification of Rockwell Hardness & Rockwell Superficial Hardness Testers (cont)	HR15TW: (60 to 80) HR15TW (80 to 86) HR15TW (86 to 93) HR15TW HR30TW: (15 to 56) HR30TW (56 to 69) HR30TW (69 to 83) HR30TW	0.29 HR15TW 0.58 HR15TW 0.53 HR15TW 0.48 HR30TW 0.41 HR30TW 0.45 HR30TW	Rockwell hardness test blocks

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,4,6} (±)	Comments
Temperature ³ – Measure Water Baths, Thermal Wells, Refrigerators, Chambers	(-196 to 0) °C (0 to 660) °C	0.021 °C 0.007 % + 0.021 °C	Fluke 1502A + 5609 PRT
Temperature ³ – Measuring Equipment Digital & Analogue Thermometers	(-5 to 125) °C (50 to 660) °C	0.021 °C 0.007 % + 0.021 °C	Fluke 1502A + 5609 PRT, Accumac PRT, thermal baths.
Relative Humidity – Measuring Equipment	(10 to 80) % RH	1.1 % RH	Rotronic sensor
Infrared Temperature – Measuring Equipment	(35 to 500) °C	0.42 % of rdg + 0.33 °C	Fluke 4181 $\epsilon = 0.9$ to 1.0 $\lambda = (8$ to $14) \mu\text{m}$

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6} ($\pm$)	Comments
Frequency ³ – Measure	DC to 3 GHz	0.21 μ Hz/Hz	Agilent 53132A opt.10
Frequency ³ – Measuring Equipment	DC to 600 MHz	0.21 μ Hz/Hz	Fluke 5520A/SC600
Stopwatches / Timers ³	(0 to 19.99) s/day	0.037 s/day	Timometer

¹ This laboratory offers commercial and field calibration service.

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 In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches and percentages are percentage of reading, unless otherwise indicated.

⁵ This scope meets A2LA's *P112 Flexible Scope Policy*.

⁶ 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.

⁷ 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.

⁸ In the statement of CMC, IV represents "Indicated Value".



Accredited Laboratory

A2LA has accredited

INSTRUMENT CALIBRATION SOLUTIONS, LLC

Clayton, OH

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 ANSI/NCSL Z540-1-1994 and 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 19th day of December 2024.

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

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2332.02
Valid to February 28, 2027

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