



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

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CALIBRATION

Valid To: August 31, 2025

Certificate Number: 2332.01

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. Dimensional

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Bore Gages	Up to 4 in	(52 + 26L)	Ring gages
Calipers ³	Up to 24 in (24 to 40) in	0.7 μ in/in + 430 μ in 11 μ in/in + 340 μ in	Gage blocks
Coating Thickness Gages	Up to 60 mils	0.13 % + 0.14 mils	Thickness standards
End Rods	Up to 20 in Up to 40 in	2 μ in/in + 15 μ in 2 μ in/in + 27 μ in	LMU1000A
Gage Blocks	(0.05 to 1) in (1 to 4) in (4 to 20) in	2.2 μ in/in + 2.4 μ in 1.4 μ in/in + 1.7 μ in 1.9 μ in/in + 0.6 μ in	Lab master, LMU1000A, master gage blocks
Height Gage	Up to 48 in	(50 + 4.1L) μ in	Gage blocks

Parameter/Equipment	Range	CMC ² (±)	Comments
Indicators	Up to 2 in	16 µin	Lab master, LMU1000A, master gage blocks
Length (Length/Distance Functions of Force Measurement Test Stands) ³	(1 to 8) in (8 to 20) in	63 µin/in + 1200 µin 0.006 in	Grade AS2 or better gage blocks
Measuring Microscopes – X-Y Axis	Up to 12 in	3 µin/in + 65 µin	6 x 12 glass grid
Micrometer ³	Up to 1 in (1 to 4) in (4 to 24) in (24 to 40) in	4.0 µin/in + 10 µin 2.9 µin/in + 43 µin 2.9 µin/in + 77 µin 1.7 µin/in + 400 µin	Gage blocks
Optical Comparators ³ – Linear Accuracy Angle X/Y Perpendicularity Magnification	Up to 12 in 30 in chart (in decimal degree) ≤ 3 in Up to 30 in chart	2.8 µin/in + 76 µin 0.022° 80 µin 0.003 in	Max Levy glass grid
Pins, Plug Gages, & Master Disk	Up to 20 in	1.5 µin/in + 9.3 µin	Lab master, LMU1000A, master gage blocks
Ring Gages	(0.125 to 0.25) in (0.25 to 1) in (1 to 3) in (3 to 15) in	11 µin 5.3 µin/in + 9.8 µin 1.0 µin/in + 14 µin 1.6 µin/in + 14 µin	LMU1000A

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Surface Plates Grade AA, A, & B ³ –			
Flatness	Up to 192 in <i>DL</i>	5.3 μ in + 0.51 μ in/in	LDDM laser <i>DL</i> = diagonal length
Repeat Reading	Up to 0.002 in	24 μ in	Repeat-o-meter
Surface Roughness Meters & Profilometer	(119.0 to 121.0) μ in Ra	2.1 μ in	Roughness specimen
Tape Measure	Up to 100 ft	0.004 % + 0.0014 in	LDDM laser
Thread Plug Simple Pitch Diameter	Up to 8 in	96 μ in	LMU1000A & thread wires
Video Measuring Systems ³ –			
X-Y Axis	Up to 12 in Up to 18 in Up to 24 in	3.7 μ in/in + 34 μ in 5.2 μ in/in + 27 μ in 5.1 μ in/in + 34 μ in	6 x 12 glass grid 12 x 12 glass grid 18 x 24 glass grid
Z Axis	Up to 4 in	13 μ in/in + 33 μ in	Gage blocks

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
DC Voltage ^{3, 6} – 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	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
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 μV/V + 0.53 μV 5.2 μV/V + 1.4 μV 7.4 μV/V + 53 μV 23 μV/V + 330 μV 0.05 % + 0.006 V 0.07 % + 0.06 V 0.12 % + 0.06 V 0.28 % + 0.06 V	Agilent 3458A opt 2 Vitrek 4700 Vitrek HVL-35 Vitrek HVL-70 Vitrek HVL-150
DC Current ^{3, 6} – Generate	(0 to 329.999) μA (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 μA 0.01 % + 0.25 μA 0.01 % + 2.5 μA 0.02 % + 0.04 mA 0.039 % + 0.032 mA 0.051 % + 0.5 mA 0.095 % + 1.6 mA	Fluke 5520A
Clamp-On Meters	(20 to 1000) A	0.31 % + 0.59 A	Fluke 5520A w/ 50 turn coil
DC Current ^{3, 6} – Measure	(0 to 120) nA (0 to 1.2) μA (0 to 12) μA (0 to 120) μA (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/μA + 0.052 nA 0.026 nA/μA + 0.087 nA 0.027 nA/μA + 0.76 nA 0.025 μA/mA + 0.0053 μA 0.026 μA/mA + 0.053 μA 0.046 μA/mA + 0.54 μA 0.13 mA/A + 0.012 mA	Agilent 3458A opt 2

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Resistance ^{3, 6} – 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) kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (0.33 to 1.099 999) MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.999) MΩ (330 to 1100) MΩ	45 μΩ/Ω + 1000 μΩ 32 μΩ/Ω + 1400 μΩ 29 μΩ/Ω + 1400 μΩ 27 μΩ/Ω + 2100 μΩ 29 mΩ/kΩ + 1.6 mΩ 27 mΩ/kΩ + 21 mΩ 29 mΩ/kΩ + 16 mΩ 27 mΩ/kΩ + 210 mΩ 29 mΩ/kΩ + 160 mΩ 33 mΩ/kΩ + 2000 mΩ 32 Ω/MΩ + 2.3 Ω 60 Ω/MΩ + 30 Ω 130 Ω/MΩ + 43 Ω 250 Ω/MΩ + 2600 Ω 520 Ω/MΩ + 2900 Ω 3000 Ω/MΩ + 110 000 Ω 15 000 Ω/MΩ + 570 000 Ω	Fluke 5520A
Fixed Points	1.0 mΩ 10.0 mΩ 100.0 mΩ 1.0 Ω 10.0 Ω 100.0 Ω	0.000 25 mΩ 0.0025 mΩ 0.025 mΩ 0.000 25 Ω 0.0025 Ω 0.025 Ω	Fixed standard resistors
Resistance ^{3, 6} – Measure	(0 to 12) Ω (0 to 120) Ω (0 to 1.2) kΩ (0 to 12) kΩ (0 to 120) kΩ (0 to 1.2) MΩ (0 to 12) MΩ (0 to 120) MΩ (0 to 1.2) GΩ	18 μΩ/Ω + 70 μΩ 15 μΩ/Ω + 700 μΩ 12 mΩ/kΩ + 2.4 mΩ 12 mΩ/kΩ + 24 mΩ 12 mΩ/kΩ + 240 mΩ 18 Ω/MΩ + 3.3 Ω 61 Ω/MΩ + 120 Ω 610 Ω/MΩ + 2100 Ω 5700 kΩ/GΩ + 110 kΩ	Agilent 3458A opt 2

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTDs ³ –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.08 °C 0.08 °C 0.09 °C 0.11 °C 0.12 °C 0.14 °C 0.24 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.08 °C 0.08 °C 0.1 °C 0.11 °C 0.12 °C 0.14 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 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	0.26 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.1 °C 0.11 °C 0.12 °C 0.24 °C	
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	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTDs ³ – (cont)			
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	Fluke 5520A
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 5520A
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	
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	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouples ³ – (cont)			
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	Fluke 5520A
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, 4} (±)	Comments
AC Voltage ^{3, 6} – Generate			
(1 to 32.999) 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	0.079 % + 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 5520A
(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	
(330 mV to 3.3) 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	
AC Voltage ^{3, 6} – 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	0.034 % + 3.5 µV 0.023 % + 1.2 µV 0.034 % + 1.3 µV 0.11 % + 1.3 µV 0.58 % + 1.2 µV 4.6 % + 2.2 µV	Agilent 3458A opt 2

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ^{3,6} – Measure (cont)			
(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	Agilent 3458A opt 2
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	
(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	
Up to 10 kV ⁷	(30 to 200) Hz	±0.16 % + 0.006 V	Vitrek 4700

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Voltage ^{3,6} – Measure (cont) (10 to 30) kV ⁷ (30 to 50) kV ⁷ (50 to 70) kV ⁷	(30 to 200) Hz (30 to 100) Hz < 65 Hz	0.14 % + 0.06 V 0.16 % + 0.06 V 0.69 % + 0.06 V	Vitrek HVL-35 Vitrek HVL-70 Vitrek HVL-150
AC Current ^{3,6} – 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 5520A
(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	
(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	
(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	
			Fluke 5520A & 50 turn coil

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Current ³ – Generate (cont)			
(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	Fluke 5520A & 50 turn coil
Clamp Meters: (20 to 1000) A	(45 to 65) Hz	0.4 % + 0.051 A	
AC Current ^{3,6} – Measure			
(6 to 120) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 35 nA 0.17 % + 35 nA 0.071 % + 35 nA 0.071 % + 35 nA	Agilent 3458A opt 2
(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 % + 0.23 µA 0.17 % + 0.24 µA 0.073 % + 0.23 µA 0.036 % + 0.23 µA 0.073 % + 0.23 µA 0.47 % + 0.46 µA 0.65 % + 1.7 µA	
(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 % + 2.3 µA 0.17 % + 2.4 µA 0.073 % + 2.3 µA 0.036 % + 2.3 µA 0.073 % + 2.3 µA 0.47 % + 4.6 µA 0.65 % + 17 µA	
(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 % + 23 µA 0.17 % + 24 µA 0.073 % + 23 µA 0.036 % + 23 µA 0.073 % + 23 µA 0.47 % + 46 µA 0.65 % + 170 µA	
(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	0.46 % + 0.24 mA 0.19 % + 0.23 mA 0.092 % + 0.23 mA 0.11 % + 0.23 mA 0.35 % + 0.24 mA 1.2 % + 0.47 mA	

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
Capacitance ³ – Generate			Fluke 5520A
(0.19 to 0.3999) nF	10 Hz to 10 kHz	0.5 % + 0.01 nF	
(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 (±)	Comments
Oscilloscope ³ –			
Amplitude – 50 Ω Load 1 MΩ Load	(-6.6 to 6.6) V (-130 to 130) V	0.25 % of output + 40 µV 0.05 % of output + 40 µV	Fluke 5520A/SC600
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	2.0 % of output + 300 µV 3.5 % of output + 300 µV 4.0 % of output + 300 µV 6.0 % of output + 300 µV	
Flatness – Relative to 50 kHz 5 mV to 5.5 V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.5 % of output + 100 µV 2.0 % of output + 100 µV 4.0 % of output + 100 µV	

Parameter/Equipment	Range	CMC ² (±)	Comments
Oscilloscope ³ – (cont)			
Time Marker ⁶ – 50 Ω Load	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.5 % of output + 100 μV 2.0 % of output + 100 μV 4.0 % of output + 100 μV	Fluke 5520A/SC600
Edge ⁶ – Rise Time 50 Ω Load	At Cardinal Point Sequence 5-2-1: 5 s to 50 ms 20 ms to 100 ns (50 to 20) ns 10 ns (5 to 2) ns ≤ 300 ps	(25 + 1000t) μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s 2.5 μs/s + 0.0 ps / -100 ps	t = time in seconds

III. Mechanical

Parameter/Equipment	Range	CMC ^{2, 5, 7} (±)	Comments
Balance & Scales	Up to 30 kg Up to 500 lb	0.0002 % + 0.026 mg 0.015 % + 0.000 05 lb	Class F weight
Force Gauges & Load Cells	(0.5 to 500) lbf (0 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	± 0.01 % of rdg + 0.002 lbf 0.021 lbf 0.10 lbf 0.48 lbf 1.1 lbf 4.3 lbf 30 lbf 63 lbf	Direct comparison to ASTM Class 6 & 7 weights &/or load cells tension & compression Load cells tension & compression Compression only
Crosshead Speed	(0.005 to 20) in/min	0.24 % + 0.004 in/min	Steel rule, stopwatch

Parameter/Equipment	Range	CMC ² (±)	Comments
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 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	0.81 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 0.29 HR15TW 0.58 HR15TW 0.53 HR15TW 0.48 HR30TW 0.41 HR30TW 0.45 HR30TW	Rockwell hardness test blocks

Parameter/Equipment	Range	CMC ^{2, 5, 7} ($\pm$)	Comments
Pressure ³ – Measuring Equipment			
Pneumatic, Absolute	(0 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 0.0019 psia 0.0020 psia 0.0026 psia	Mensor CPC6000 transducers
Pneumatic	(4 to 860) inH ₂ O (0 to 1) psi (1 to 6.4) psi (3 to 500) psi (501 to 1500) psi 1501 to 5000 psi (0 to 2) in H ₂ O	0.02 % 0.000 12 psi 0.0008 psi 0.01 % + 0.000 06 psi 0.012 % + 0.003 psi 0.012 % + 0.001 psi 0.000 48	PKII 654WC-SS Mensor CPC6050 transducers T3500 Deadweight Mensor CPC8000 transducer Dwyer 1430 microtector
Vacuum	(0 to -15) psi (0 to -1) psi	0.002 psi 0.0001 psi	Mensor CPC6000 transducer
Water	(10 to 10 000) psi	0.01 % + 0.0006 psi	Fluke P3224
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 (20 to 2200) lbf·ft	0.02 % + 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 0.05 % + 0.005 lbf·ft	5 in Wheel 5 in Wheel 20 in Wheel 20 in Wheel 20 in Wheel 40 in arm, class F weights ASTM Class 6 weights

IV. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 5, 7} ($\pm$)	Comments
Temperature ³ – Measure	(-200 to 0) °C (0 to 660) °C	0.0041 % + 0.016 °C 0.0012 % + 0.016 °C	Additel (PRT system) AM1751
Relative Humidity – Measuring Equipment	Up to 80 % RH	0.3 % + 0.52 % RH	GeoCal 2000SP, Rotronic HC2A-SH
Infrared Temperature	(35 to 500) °C	0.42 % + 0.33 °C	Fluke 4181

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Frequency ³ – Measure	DC to 3 GHz	1.7 parts in 10 ⁷ Hz	Agilent 53132A opt.10 conditioned by a Datum 9390-6000 GPS
Frequency ³ – Measuring Equipment	DC to 600 MHz	1.7 parts in 10 ⁷ Hz	Fluke 5520A/SC600 conditioned by a Datum 9390-6000 GPS
Stopwatches / Timers ³	1 s to 24 hrs	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 Calibration and Measurement Capability Uncertainty (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 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 percentage or fraction of the reading plus a fixed floor specification.

⁵ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches and % is the percent of reading unless otherwise stated.

⁶ In the statement of CMC, the contributions from "the best existing device" are not included.

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



Accredited Laboratory

A2LA has accredited

INSTRUMENT CALIBRATION SOLUTIONS, LLC

Aliquippa, PA

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 30th day of June 2023.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2332.01
Valid to August 31, 2025

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