



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

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CALIBRATION

Valid To: May 31, 2025

Certificate Number: 1332.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional testing^{1, 12}:

I. Acoustical Qualities

Parameter/Equipment	Range	CMC ($\pm$)	Comments
Sound Level Meters	94 dB and 114 dB 1000 Hz	0.44 dB	Type 4231 Sound Level Calibrator

II. Chemical

Parameter/Equipment	Range	CMC ^{2, 11} ($\pm$)	Comments
Conductivity Equipment	14 000 μ S 8400 μ S 3900 μ S	140 μ S 140 μ S 39 μ S	Conductivity solutions
pH Measuring Equipment	(4, 7, 10) pH	0.02 pH	pH buffer solutions
Refractometers	Up to 30 % Brix (30 to 80) % Brix	0.04 % 0.06 %	Standard solutions

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Bore Gages	Up to 8 in	$(39 + 2.5D) \mu\text{in}$	Comparison to ring Gages or gage blocks
Length Standard/Rod	(0.1 to 12) in (12.1 to 24) in (24.1 to 48) in	11 μin 26 μin 46 μin	Labmaster comparison to gage blocks
Gage Blocks	(0.1 to 1.0) in (>1.0 to 4.0) in (>4.0 to 12) in	$(3.9 + 0.5L) \mu\text{in}$ $(4.4 + 0.5L) \mu\text{in}$ $(8.2 + 0.5L) \mu\text{in}$	Master gage block set
Calipers ³	Up to 40 in	$(300 + 1L) \mu\text{in}$	Gage blocks
Micrometers ³	Up to 12 in	$(51 + 1L) \mu\text{in}$	Gage blocks
Depth Micrometers ³	Up to 9 in	$(31 + 1L) \mu\text{in}$	Gage blocks
Height Gages ³	Up to 40 in	$(65 + 1L) \mu\text{in}$	Gage blocks
Thread Wires	Up to 80 TPI Up to 4 mm	13 μin 0.41 μm	Pratt & Whitney Labmaster TM
Thread Plugs – Major Diameter Pitch Diameter	Up to 3 in (4 to 80) TPI	$(14 + 0.9L) \mu\text{in}$ 72 μin	SIP 305M

Parameter/Equipment	Range	CMC ^{2,4} ($\pm$)	Comments
Micrometer Heads	Up to 2 in	29 μ in	Gage blocks/Indi-check
Thread Rings ¹⁰ – Adjustable	(0.12 to 4) in	(X) Set Plug Tolerance	Set using master plug gages. ASME/ANSI B1.2-1983 & ASME/ANSI B1.3-2007
Master Thread Rings	(0.12 to 8) in	(19 + 1.8L) μ in	Pratt & Whitney Labmaster TM
Indicators ³	Up to 1 in	54 μ in	Micrometer head
Test Indicators ³	Up to 0.1 in	47 μ in	Micrometer head
Gage Pins ³	(0.001 to 1) in	14 μ in	Pratt & Whitney Labmaster TM
	(0.001 to 1) in	35 μ in	Laser micrometer
Plug Gages	(1.00 to 4) in	(14 + 0.9L) μ in	Pratt & Whitney Labmaster TM
Surface Plates ³ – Overall Flatness Only	(18 $\times$ 36) in ² to (36 $\times$ 72) in ²	(29 + DL) μ in	Electrical leveling system

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Ring Gages – Classes X, Y, Z, & ZZ	Up to 1 in (1 to 5) in (5 to 10) in	(12 + 1.8L) μ in (18 + 1.8L) μ in (27 + 1.8L) μ in	Pratt & Whitney Labmaster TM
Optical Comparators ³	Up to 12 in (12 to 24) in (24 to 30) in (10 to 100) x	(92 + 3L) μ in (140 + 3L) μ in (190 + 3L) μ in 180 μ in	Glass master scale, gage blocks, magnification checker
Precision Levels	Up to 18 in	40 μ in/10 in	Gage blocks, surface plate
Protractors	(0 to 180) $^{\circ}$	0.2 $^{\circ}$	Sine plate, gage blocks
Surface Finish – Profilometer Ra	117 μ in	2.2 μ in	Master surface finish standard
Surface Finish – Measure Profilometer & Surface Roughness	Up to 400 μ in	2.2 μ in	Profilometer
Spheres & Precision Balls – Diameter Roundness	Up to 3 in Up to 3 in	(14 + 0.5L) μ in 2.9 μ in	Pratt & Whitney Labmaster TM Roundness measuring machine

IV. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ^{2, 4, 11} ($\pm$)	Comments
1-Dimensional Length ⁸ – Measure	Up to 6 in Up to 8 in Up to 8 in	(51 + 1L) μ in (180 + 6L) μ in (310 + L) μ in	Digital micrometer Optical comparator Digital caliper
Angle ⁸ – Measure	(0 to 180) $^{\circ}$	7 arc secs	Contourecord

Parameter/Equipment	Range	CMC ^{2, 4, 11} ($\pm$)	Comments
Thickness (Feeler) Gages	Up to 1 in	27 μ in	Pratt & Whitney Labmaster TM
Coating Thickness Shims/Precision Shims	(0 to 20) mil	0.05 mil	Pratt & Whitney Labmaster TM
3-Dimensional Length ⁸ – Measure			
X-Axis	Up to 35.4 in	(66 + 3.6L) μ in	CMM
Y-Axis	Up to 59 in	(66 + 3.6L) μ in	
Z-Axis	Up to 25.6 in	(66 + 3.6L) μ in	
X-Axis	Up to 20 in	86 μ in	Vision System
Y-Axis	Up to 18 in	86 μ in	
Z-Axis	Up to 8 in	150 μ in	

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} ($\pm$)	Comments
DC Voltage – Measure ³	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V (0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	7 μ V/V + 9.6 μ V 6 μ V/V + 5.3 μ V 6 μ V/V + 5.9 μ V 8 μ V/V + 100 μ V 8 μ V/V + 0.27 mV .79V 1.5 V 5.6 V	HP 3458A with opt 002 Vitretek 4700A
DC Voltage – Generate ³	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 μ V/V + 25 μ V 11 μ V/V + 24 μ V 12 μ V/V + 210 μ V 18 μ V/V + 2 mV 18 μ V/V + 6.3 mV	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} ($\pm$)	Comments
DC Current – Generate ³	(0 to 330) μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20) A	0.015 % + 0.042 μ A 0.01 % + 0.074 μ A 0.01 % + 0.63 μ A 0.01 % + 14 μ A 0.02 % + 44 μ A 0.038 % + 38 μ A 0.05 % + 1.3 mA 0.1 % + 3.8 mA	Fluke 5520A
Clamp-On	(20 to 150) A (150 to 550) A (550 to 1000) A	0.3 % + .25A 0.3 % + .31A 0.3 % + .31A	Fluke 5520A with 50 turn coil
DC Current – Measure ³	(10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	20 μ A/A + 12 μ A 20 μ A/A + 9.5 μ A 20 μ A/A + 5.8 μ A 35 μ A/A + 5.8 μ A 0.011 % + 12 μ A	HP 3458A
Resistance – Measure ³	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	15 $\mu\Omega/\Omega$ + 6.4 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 12 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 100 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 0.98 m Ω 10 $\mu\Omega/\Omega$ + 1.1 m Ω 15 $\mu\Omega/\Omega$ + 1.7 Ω 50 $\mu\Omega/\Omega$ + 12 Ω 0.05 % + 11 k Ω 0.5 % + 12 k Ω	HP 3458A

Parameter/Equipment	Range	CMC ^{2, 5, 6, 9} ($\pm$)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω 330 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 M Ω to 1.1 G Ω	40 $\mu\Omega/\Omega + 0.0012 \Omega$ 30 $\mu\Omega/\Omega + 0.0019 \Omega$ 28 $\mu\Omega/\Omega + 0.0025 \Omega$ 28 $\mu\Omega/\Omega + 0.0048 \Omega$ 28 $\mu\Omega/\Omega + 0.010 \Omega$ 28 $\mu\Omega/\Omega + 0.036 \Omega$ 28 $\mu\Omega/\Omega + 0.086 \Omega$ 28 $\mu\Omega/\Omega + 0.36 \Omega$ 28 $\mu\Omega/\Omega + 0.83 \Omega$ 32 $\mu\Omega/\Omega + 3.6 \Omega$ 32 $\mu\Omega/\Omega + 2.4 \Omega$ 60 $\mu\Omega/\Omega + 35 \Omega$ 0.013 % + 59 Ω 0.025 % + 2.9 k Ω 0.05 % + 3.5 k Ω 0.3 % + 0.12 M Ω 1.5 % + 0.58 M Ω	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2, 6, 9} ($\pm$)	Comments
AC Voltage – Measure ³			
(5 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 4.1 μ V 0.02 % + 4.1 μ V 0.03 % + 4.2 μ V 0.1 % + 4.5 μ V 0.5 % + 5.2 μ V 4 % + 7.5 μ V	HP 3458A
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μ V/V + 7.1 μ V 72 μ V/V + 7.1 μ V 15 μ V/V + 7.4 μ V 0.03 % + 17 μ V 0.08 % + 17 μ V 0.3 % + 110 μ V 1 % + 110 μ V 1.5 % + 110 μ V	
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μ V/V + 31 μ V 72 μ V/V + 31 μ V 15 μ V/V + 35 μ V 0.03 % + 41 μ V 0.08 % + 43 μ V 0.3 % + 0.077 mV 1 % + 0.51 mV 1.5 % + 0.51 mV	

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments
AC Voltage – Measure ³ (cont)			
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	72 μ V/V + 0.65 mV 72 μ V/V + 0.54 mV 15 μ V/V + 0.54 mV 0.03 % + 0.65 mV 0.08 % + 0.65 mV 0.3 % + 1.1 mV 1 % + 6 mV 1.5 % + 6 mV	HP 3458A
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.02 % + 3.7 mV 0.02 % + 3.7 mV 0.02 % + 3.9 mV 0.036 % + 4.9 mV 0.12 % + 6.7 mV 0.4 % + 11 mV 1.5 % + 11 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 120 mV 0.04 % + 120 mV 0.06 % + 120 mV 0.12 % + 120 mV 0.3 % + 120 mV	
(0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	(50 to 60) Hz	2.8 V 9.9V 13 V	
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	0.08 % + 14 μ V 0.015 % + 14 μ V 0.02 % + 14 μ V 0.1 % + 17 μ V 0.35 % + 27 μ V 0.8 % + 82 μ V	Fluke 5520A
(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	0.05 % + 31 μ V 0.015 % + 31 μ V 0.016 % + 31 μ V 0.035 % + 42 μ V 0.08 % + 69 μ V 0.2 % + 240 μ V	

Parameter/Range	Frequency	CMC ^{2, 6, 9} (±)	Comments
AC Voltage – Generate ³ (cont)			
(0.33 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	0.03 % + 66 µV 0.015 % + 210 µV 0.019 % + 210 µV 0.03 % + 350 µV 0.07 % + 0.57 mV 0.24 % + 3 mV	Fluke 5520A
(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	0.03 % + 3.1 mV 0.015 % + 4 mV 0.024 % + 4 mV 0.035 % + 5 mV 0.09 % + 7.5 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	0.019 % + 4.7 mV 0.02 % + 8.1 mV 0.025 % + 32 mV 0.03 % + 93 mV 0.2 % + 71 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 35 mV 0.025 % + 91 mV 0.03 % + 93 mV	
AC Current – Measure ³			
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.4 % + 40 nA 0.15 % + 40 nA 0.06 % + 40 nA 0.06 % + 40 nA	HP 3458A
100 µA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 0.3 µA 0.15 % + 0.3 µA 0.06 % + 0.3 µA 0.03 % + 0.3 µA 0.06 % + 0.3 µA 0.4 % + 0.5 µA 0.55 % + 1.8 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 2.9 µA 0.15 % + 2.9 µA 0.06 % + 2.9 µA 0.03 % + 2.9 µA 0.06 % + 2.9 µA 0.4 % + 5.4 µA 0.55 % + 18 µA	

Parameter/Range	Frequency	CMC ^{2, 5, 9} (±)	Comments
AC Current – Measure ³ (cont)			
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.4 % + 30 µA 0.15 % + 30 µA 0.06 % + 30 µA 0.03 % + 30 µA 0.06 % + 30 µA 0.4 % + 50 µA 0.55 % + 180 µA	HP 3458A
Fixed Point, 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.4 % + 0.31 mA 0.16 % + 0.31 mA 0.08 % + 0.31 mA 0.1 % + 0.31 mA 0.3 % + 0.31 mA 1 % + 0.51 mA	
AC Current – Generate ³			
(29 to 330) µA	(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	0.2 % + 0.28 µA 0.15 % + 0.28 µA 0.13 % + 0.28 µA 0.3 % + 0.32 µA 0.8 % + 0.37 µA 1.6 % + 0.54 µA	Fluke 5520A
330 µA 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	0.2 % + 0.33 µA 0.13 % + 0.33 µA 0.1 % + 0.33 µA 0.2 % + 0.37 µA 0.5 % + 0.65 µA 1 % + 1.1 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	0.18 % + 2.5 µA 0.09 % + 2.5 µA 0.04 % + 2.5 µA 0.08 % + 3.9 µA 0.2 % + 5.7 µA 0.4 % + 7.2 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	0.18 % + 25 µA 0.09 % + 25 µA 0.04 % + 25 µA 0.1 % + 59 µA 0.2 % + 0.12 mA 0.4 % + 0.24 mA	

Parameter/Range	Frequency	CMC ^{2, 5, 9} (±)	Comments
AC Current – Generate ³ (cont)			
33 mA to 3 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 0.25 mA 0.06 % + 0.25 mA 0.6 % + 1.2 mA 2.5 % + 5.8 mA	Fluke 5520A
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06 % + 3.4 mA 0.1 % + 3.4 mA 3 % + 3.4 mA	
(11 to 21) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 14 mA 0.15 % + 14 mA 3 % + 14 mA	
(20 to 1000) A	(45 to 440) Hz	0.3 % + 140 mA	Fluke 5520A with 50 turn coil
Capacitance – Generate ³			
(0.19 to 0.4) nF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz	0.5 % + 0.03 nF 0.5 % + 0.03 nF 0.5 % + 0.03 nF 0.25 % + 0.03 nF 0.25 % + 0.13 nF 0.25 % + 0.19 nF 0.25 % + 0.56 nF	Fluke 5520A
(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	(10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz Up to 80 Hz Up to 50 Hz	0.25 % + 1.8 nF 0.25 % + 3.8 nF 0.25 % + 21 nF 0.4 % + 60 nF 0.45 % + 0.79 µF 0.45 % + 0.78 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	Up to 20 Hz Up to 6 Hz Up to 2 Hz Up to 0.6 Hz Up to 0.2 Hz	0.45 % + 1.9 µF 0.45 % + 4 µF 0.45 % + 16 µF 0.75 % + 37 µF 1.1 % + 130 µF	

Parameter/Range	Frequency	CMC ^{2, 5, 7} (±)	Comments
Inductance – Generate			
Fixed Point	1 mH 50 mH 5 H	0.15 % 0.16 % 0.16 %	GR 1482-E GR 1482-K GR 1482-R
Hypot Testers			
DC	(0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	.79 V 1.5 V 5.6 V	Vitretek 4700A
AC (50 to 60 Hz)	(0.1 to 1.0) kV (1.0 to 4.0) kV (4.0 to 9.0) kV	2.8 V 9.9 V 13 V	
Oscilloscopes ³ –			
Amplitude, DC Signal 50 Ω Load 1 MΩ Load	Up to 6.6) V Up to 130) V	0.29 % IV + 40 μV 0.058 % IV + 40 μV	Fluke 5520A
Amplitude, Square Wave 50 Ω Load	1 mVp-p to 6.6 Vp-p 10 Hz to 10 kHz	0.29 % IV + 40 μV	
1 MΩ Load	1 mVp-p to 130 Vp-p 10 Hz to 1 kHz	0.12 % IV + 40 μV	
Time Marker into 50 Ω Load- Source	5 s to 50 ms 20 ms to 2 ns	29 parts in 10 ⁶ + 1000 parts in 10 ⁶ /s 2.9 parts in 10 ⁶	
Leveled Sine Wave Relative to 50 kHz [5 mV to 5.5 V] p-p	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (550 to 1100) MHz (1.1 to 3.2) GHz (3.2 to 6.0) GHz	2.0 % 2.5 % 4.7 % 4.3 % 5.3 % 5.3 %	
Rise Time	10 Hz to 2 MHz (125 to 175) ps 10 Hz to 1 MHz (59 to 81) ps	20 ps 14 ps	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems ³ –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.07 °C 0.09 °C 0.12 °C 0.16 °C 0.28 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C	0.07 °C 0.09 °C 0.13 °C 0.16 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 100) °C (100 to 400) °C (400 to 600) °C (600 to 630) °C	0.30 °C 0.10 °C 0.12 °C 0.13 °C 0.28 °C	
Pt 385, 200 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.07 °C 0.18 °C 0.20 °C	
Pt 385, 500 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.08 °C 0.12 °C 0.13 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 300) °C (300 to 600) °C (600 to 630) °C	0.05 °C 0.08 °C 0.09 °C 0.28 °C	
Ni 120, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.10 °C 0.20 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Electrical Calibration of Thermocouple Indicators & Indicating Systems ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.52 °C 0.41 °C 0.36 °C 0.40 °C	Fluke 5520A
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.59 °C 0.20 °C 0.26 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.33 °C 0.21 °C 0.28 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.40 °C 0.22 °C 0.32 °C 0.48 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 410) °C (410 to 1300) °C	0.48 °C 0.27 °C 0.24 °C 0.33 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.67 °C 0.42 °C 0.40 °C 0.48 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.56 °C 0.45 °C 0.48 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.74 °C 0.28 °C 0.20 °C 0.18 °C	

VI. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2, 7, 11} (±)	Comments
Flow – Air – Measure & Measuring Equipment	0.025 SCCM to 250 SLPM	1.8 %	Standard flow meters
Air Velocity- Anemometers	Up to 16 m/s	1.9 %	Velocity comparison

VII. Magnetic Quantities

Parameter/Equipment	Range	CMC ^{2, 7, 11} (±)	Comments
DC – Gauss ³ – Measuring Equipment	5 G 10 G 20 G	5.6 %	Direct comparison to Gauss standards

VIII. Mechanical

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Accelerometer	(10 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5001 to 10 000) Hz	3 % 3 % 3 % 3 % 3 %	Dual-mode amplifier

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³	HRBW: Low Medium High HRC: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR15TW: Low Medium High HR30TW: Low Medium High HREW: Low Medium High	1 HRBW 0.7 HRBW 0.6 HRBW 0.4 HRC 0.3 HRC 0.4 HRC 0.6 HR15N 0.6 HR15N 0.3 HR15N 0.5 HR30N 0.6 HR30N 0.4 HR30N 0.5 HR15TW 0.5 HR15TW 0.4 HR15TW 0.5 HR30TW 0.6 HR30TW 0.5 HR30TW 1.0 HREW 1.0 HREW 1.0 HREW	ASTM E18
Indirect Verification of Brinell Hardness Testers at Test Conditions			
10/3000/15	(100 to 199) HBW	6.6 HBW	Indirect verification Method per ASTM E10

Parameter/Equipment	Range	CMC ^{2, 7, 11} (±)	Comments
Indirect Verification of Micro Indentation Hardness Testers ³ – Knoop Vickers	 (250 to 600) HK (600 to 800) HK (250 to 600) HV (600 to 800) HV	 12 HK 27 HK 8.4 HV 26 HV	 Indirect comparison with test blocks to ASTM E92
Torque Wrenches ³	(4 to 1000) lbf·in (20 to 600) lbf·ft	0.5 % 0.5 %	CDI Suretest 5000-ST
Torque Wrenches	(100 to 2000) lbf·ft	0.59 %	CDI Computest
Torque Transducer	0.5 ozf·in to 2000 lbf·ft	0.092 %	Arm & weights
Force – Compression ³ – Measure & Measuring Equipment	Up to 50 000 lbf (50 to 200) klbf	0.48 % 0.52 %	Load cells
Pneumatic Gage Pressure ³ – Measuring Equipment	(10 to 1000) psi (-12 to 300) psig (300 to 3000) psig (3000 to 10 000) psig	0.05 % 0.075 % 0.24 % 0.35 %	Deadweight pneumatic Fluke pressure calibrator
Scales ³	(1 to 500) mg 500 mg to 100 g (100 to 500) g (1 to 70) lb (453.592 g to 71.752 kg) (70 to 600) lb (71.752 kg to 272.155 kg)	0.022 mg 0.32 mg 8.6 mg 0.24 lb 110 mg 0.97 lb 440 mg	Weights
Mass Measurement	500 mg to 100 g 100 g to 210 g	0.68 mg 0.97 mg	Electronic Balance / ASTM Class 1 mass pieces

IX. Optical Quantities

Parameter/Equipment	Range	CMC ($\pm$)	Comments
Luminance – Measuring Equipment	5.00 FL 20.0 FL 200.0 FL 2000.0 FL	5.0 % 4.3 % 3.9 % 4.3 %	Luminance/Radiance standard

X. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 7, 11} ($\pm$)	Comments
Humidity ³ – Measure & Measuring Equipment	(10 to 90) % RH (90 to 95) % RH	1.4 % 2.0 %	Temperature/ humidity standard
Temperature – Measure ³ (Freezers, Refrigerators, Incubators, Ovens, Environmental Chambers, & Furnaces)	(0 to 1200) °C (-200 to 0) °C	1.4 °C 1.5 °C	Fluke 725/ thermocouples
Infrared Thermometer ³	(122 to 289) °F (290 to 591) °F (592 to 932) °F	1.1 °F 5.1 °F 9.9 °F	Fluke 9132
Temperature ³ – Measure Drywell	(0 to 300) °C (300 to 660) °C	0.067 °C 0.31 °C	Fluke 5627A PRT Fluke 5609 PRT
Temperature ³ – Measuring Equipment (Thermometers, Thermocouples, Temperature Probes)	(-45 to 140) °C (50 to 425) °C (425 to 660) °C (0 to 660) °C	0.17 °C 0.26 °C 0.77 °C 0.37 °C	Fluke 9170 Drywell Fluke 9173 Drywell Fluke 9173 Drywell Fluke 5609 PRT, Thermal bath

XI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 3, 7, 11} ($\pm$)	Comments
Frequency – Measuring Equipment ³ (Time Base)	10 Hz to 3 GHz	2.3 μ Hz/Hz	Fluke PM6690
Non-Contact (Photo) Tachometers	(0.01 to 100 000) RPM	0.02 %	Fluke 5520A, LED
Stopwatches/Timers ³	Up to 24 hrs	0.6 sec	Certified stopwatch

¹ This laboratory offers commercial dimensional testing/calibration service 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; R is the numerical value of the resolution of the device in microinches or micrograms, FS is full scale, and DL is the Diagonal Length of the plate in inches.

⁵ Based on using the standard at the temperature the Fluke 5520A was calibrated (tcal) within ± 5 °C and assuming the instrument is zeroed at least every seven days or when ambient temperature changes more than 5 °C. For resistance, a zero calibration is performed at least every 12 hours within ± 1 °C of use. For AC Current, best uncertainties are determined with LCOMP Off. The CMC is based upon 1-year specifications and using the standard at ambient temperature that is within ± 5 °C of tcal.

⁶ Based on using the standard at the temperature the HP 3458A was calibrated (tcal) within ± 5 °C and an auto-calibration (ACAL) was performed within the previous 24 hours (± 1 °C of ambient temperature). The CMC is based upon 1-year specification and using the standard at ambient temperature that is within ± 5 °C of tcal.

⁷ In the statement of CMC, percentage (%) refers to percent of reading, unless otherwise noted.

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.

- ⁹ 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 are expressed as either a specific value that covers the full range or as a fraction/percent of the reading plus a fixed floor specification.
- ¹⁰ Adjustable thread rings are set to applicable specifications using calibrated master set plug gages.
- ¹¹ 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.
- ¹² This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

INCAL TECHNOLOGIES, INC.

Saginaw, MI

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 18th day of July 2023.

A blue ink signature of Mr. Trace McInturff, Vice President of Accreditation Services.

Mr. Trace McInturff Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1332.01
Valid to May 31, 2025
Revised November 20, 2023

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