



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

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CALIBRATION

Valid To: May 31, 2024

Certificate Number: 1387.05

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 9}:

I. Acoustics

Parameter/Equipment	Range	CMC ² (±)	Comments
Sound level Meters	94 db @ 1000 Hz	0.47 db	Sound level calibrator

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Bore Micrometers	Up to 12 in Up to 304.8 mm	$(32 + 7.5D) \mu\text{in}$ $(0.82 + 0.19D) \mu\text{m}$	Master rings
Dial Bore Gages (Bore Gage w/ Indicator)	0.000 01 in 0.000 05 in 0.0001 in 0.0005 in 0.001 in 0.000 25 mm 0.001 mm 0.0025 mm 0.01 mm 0.025 mm	7.1 μin 30 μin 58 μin 290 μin 580 μin 0.18 μm 0.75 μm 1.5 μm 7.2 μm 14 μm	Indicator calibrator

Parameter/Equipment	Range	CMC ^{2,4} ($\pm$)	Comments
Calipers ³	Up to 24 in (24 to 80) in Up to 610 mm (610 to 2032) mm	$(6.8 + 9.5L) \mu\text{in}$ $(230 + 20L) \mu\text{in}$ $(0.18 + 0.24L) \mu\text{m}$ $(5.9 + 0.52L) \mu\text{m}$	Caliper checker, gage blocks
Caliper Checkers	Up to 12 in Up to 304.8 mm	$(6.1 + 1.2L) \mu\text{in}$ $(0.15 + 0.03L) \mu\text{m}$	Electronic indicator amplifier, gage blocks
Caliper Gage ³ – Internal, External	Up to 7.5 in Up to 190.5 mm	$16 + 14D \mu\text{in}$ $0.41 + 0.36D \mu\text{m}$	Gage blocks, ring gages
Depth Step Gages	(0.5 to 11.5) in (12.7 to 290) mm	$(12 + 3.0L) \mu\text{in}$ $(0.30 + 0.003L) \mu\text{m}$	Electronic indicator amplifier, gage blocks
Cylindrical Ring Gages ³	Up to 0.425 in (0.600 to 17.5) in Up to 10.80 mm (15.24 to 480) mm	$14 \mu\text{in}$ $(14 + 0.89D) \mu\text{in}$ $0.36 \mu\text{m}$ $(0.36 + 0.023D) \mu\text{m}$	Universal length machine, master rings, gage blocks
Disc, Plug & Pin Gages ³	Up to 20 in Up to 508 mm	$(7.7 + 1.0D) \mu\text{in}$ $(0.20 + 0.025D) \mu\text{m}$	Universal length machine
Electronic Indicator Amplifier ³	Up to 0.01 in Up to 0.254 mm	$9.3 \mu\text{in}$ $0.24 \mu\text{m}$	Gage blocks, optical flat
Go/No-go Gages ⁵	Up to 12 in Up to 304.8 mm Up to 20 in Ext. Measurement Up to 11.5 in Int. Measurement Up to 6 in	$(17 + 1.1L) \mu\text{in}$ $(0.44 + 0.0011L) \mu\text{m}$ $(7.7 + 1.0D) \mu\text{in}$ $(0.20 + 0.025D) \mu\text{m}$ $(12 + 3.0L) \mu\text{in}$ $(0.30 + 0.003L) \mu\text{m}$ 0.000 30 in	Vision system Universal length machine Electronic indicator amplifier, gage blocks Rings, plugs, hand tools

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Optical Flats	Up to 3 in Up to 76.2 mm	4.4 μ in 0.12 μ m	Master optical flat
Gage Blocks – Length Only	Up to 20 in Up to 508 mm	(7.7 + 1.0D) μ in (0.20 + 0.025D) μ m	Universal length machine
Height Gages ³	Up to 40 in Up to 1016 mm	260 + 0.35 μ in 6.6 + 0.009 μ m	Gage blocks
Indicators/LVDTs ³	0.000 01 in 0.000 05 in 0.0001 in 0.0005 in 0.001 in 0.000 25 mm 0.001 mm 0.0025 mm 0.01 mm 0.025 mm	7.1 μ in 30 μ in 58 μ in 290 μ in 580 μ in 0.18 μ m 0.75 μ m 1.5 μ m 7.2 μ m 14 μ m	Indicator calibrator
Length Standards ³	Up to 20 in Up to 508 mm	(7.7 + 1.0D) μ in (0.20 + 0.025D) μ m	Universal length machine
Levels ³	Up to 12 in Up to 304.8mm	140 μ in 3.5 μ m	Surface plate, sine bar, gage blocks
Adjustable Thread Rings ⁸	Up to 4 in	120 μ in	Set using master plug gages. ASME/ANSI B1.2-1983 & ASME/ANSI B1.3-2007

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Micrometers ³ –	Up to 24 in Up to 609.6 mm	$(0.83 + 16L) \mu\text{in}$ $(0.021 + 0.41L) \mu\text{m}$	Gage blocks
	(24 to 48) in Up to 1219.2 mm	$(5.4 + 15L) \mu\text{in}$ $(0.14 + 0.39L) \mu\text{m}$	
Groove	Up to 4 in Up to 101.6 mm	$(0.96 + 16L) \mu\text{in}$ $(0.025 + 0.41L) \mu\text{m}$	
Depth	Up to 12 in Up to 304.8 mm	$(2.0 + 16L) \mu\text{in}$ $(0.06 + 0.41L) \mu\text{m}$	
Inside	Up to 20 in Up to 500 mm	$(12 + 1.0D) \mu\text{in}$ $(0.30 + 0.001D) \mu\text{m}$	
Specialty Micrometers	Up to 4 in Up to 101.6 mm	$(0.96 + 16L) \mu\text{in}$ $(0.025 + 0.41L) \mu\text{m}$	Gage blocks
Parallels	Up to 20 in Up to 508 mm	19 μin 0.49 μm	Electronic indicator amplifier
Plain Pins Class ZZ ³	Up to 2 in Up to 50.8 mm	$(32 + 9.0L) \mu\text{in}$ $(0.82 + 0.23L) \mu\text{m}$	Laser micrometer
Steel Rules ³	Up to 12 in Up to 304.8 mm	$(17 + 1.1L) \mu\text{in}$ $(0.44 + 0.0011L) \mu\text{m}$	Vision system
	(12 to 39) in (304.8 to 990.6) mm	150 μin 3.7 μm	Direct comparison
Steel Tapes ³	Up to 26 ft (26 to 100) ft	0.04 in 0.055 in	Direct comparison
Thickness & Feeler Gage ³	Up to 20 in Up to 508 mm	$(7.7 + 1.0D) \mu\text{in}$ $(0.20 + 0.025D) \mu\text{m}$	Universal length machine (ULM)

Parameter/Equipment	Range	CMC ^{2,4} ($\pm$)	Comments
Thread Plugs ³ –			
Major Diameter	Up to 8 in Up to 203.2 mm	$(7.6 + 1.3D) \mu\text{in}$ $(0.21 + 0.0013D) \mu\text{m}$	Universal length machine
Pitch Diameter	Up to 80 TPI Up to 4.0 mm pitch	$(68 + 1.2D) \mu\text{in}$ $(1.8 + 0.0012D) \mu\text{m}$	Universal length machine, thread measuring wires
Tapered Thread Plug Gage – Pitch Diameter	Up to 4 in Up to 101.6 mm	$(68 + 1.2D) \mu\text{in}$ $(1.8 + 0.0012D) \mu\text{m}$	Universal length machine, gage blocks
Step	Up to 1 in Up to 25.4 mm	15 μin 0.38 μm	Gage blocks
Radius Gages	Up to 12 in Up to 304.8 mm	$(17 + 1.1L) \mu\text{in}$ $(0.44 + 0.0011L) \mu\text{m}$	Vision system
Surface Finish Testers ³ – Ra, Ry, Rz	(2 to 500) μin (0.05 to 12.5) μm	5.0 μin 0.13 μm	Master surface finish patch
Surface Finish Standards ³ – Ra, Ry, Rz	(2 to 500) μin (0.05 to 12.5) μm	4.2 μin 0.11 μm	Direct comparison to master surface patch
Bolt Protrusion Gauges	Up to 12 in Up to 304.8 mm	$(17 + 1.1L) \mu\text{in}$ $(0.44 + 0.0011L) \mu\text{m}$	Vision system
Profilometers/ Coating Thickness Standards	(1 to 669) mils (17.0 mm)	$(7.9 + 0.92L) \mu\text{in}$	Master foils M=nominal thickness in mils, foils/shims
Spheres & Balls	Up to 6 in Up to 150 mm	$(7.9 + 0.92L) \mu\text{in}$ $(0.20 + 0.00092L) \mu\text{m}$	ULM

III. Dimensional Testing/Calibration¹

Parameter/Equipment	Range	CMC ^{2, 4, 8} ($\pm$)	Comments
Surface Finish – Measure ⁵	(2 to 500) μ in (0.05 to 12.5) μ m	4.2 μ in 0.11 μ m	Master surface finish patch
Flatness – Measure ⁵	Up to 20 in Up to 508 mm	28 μ in 0.71 μ m	Electronic indicator
	Up to 2 in Up to 50.8 mm	4.4 μ in 0.12 μ m	Optical flat
Parallelism – Measure ⁵	Up to 20 in Up to 508 mm	14 μ in 0.36 μ m	Electronic indicator amplifier
Straightness – Measure ⁵	Up to 12 in Up to 304.8 mm	22 μ in 0.56 μ m	Electronic indicator amplifier
Durometer Calibration – (A, B, C, D)			ASTM D2240
Indenter Extension & Shape –	Up to 0.2 in	65 μ in	Optical inspection under magnification
Extension	Diameter of the base of the frustrum: 0.5 in	45 μ in	
Diameter	Diameter of the top of the frustrum: 0.5 in	45 μ in	
Angle	Diameter of the base of the cone: 0.5 in	45 μ in	
35° Right Circular Conical Frustrum	Cone angle	0.015°	
30° Cone	Cone angle	0.015°	
Radius	Tip radius: 0.25 in	16 μ in	
Indenter Display	Indenter thickness Indenter radius	45 μ in 16 μ in	
Spring Calibration – Force	(0 to 100) duro units (0 to 5000) gf	0.4 duro units 0.3 gf	Balance or electronic force cell

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Inspection Fixtures ⁵ (V-Blocks, 1-2-3 Blocks, Bar Parallels, Angle Squares) –			
Angle	Up to 360°	2.4 arc sec	CMM
Flatness	Up to 700 mm	$(1.8 + L/300) \mu\text{m}$	
Perpendicularity	Up to 700 mm	$(1.8 + L/300) \mu\text{m}$	
Parallelism	Up to 700 mm	$(1.8 + L/300) \mu\text{m}$	
Geometric Measurements ⁵ (Waviness, Cylindricity, Profile, Line Profile, Form, Curve Form, Curve Jump, Position, Concentricity, Coaxially, Perpendicularity, Parallelism, Runout, Distance)	X: Up to 1800 mm Y: Up to 1800 mm Z: Up to 600 mm	$(1.8 + L/300) \mu\text{m}$ $(1.8 + L/300) \mu\text{m}$ $(1.8 + L/300) \mu\text{m}$	CMM

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
DC Voltage – Generate ³	(0 to 329.999) mV (0 to 3.2999) V (0 to 32.9999) V (30 to 329.9999) V (100 to 1020) V	25 $\mu\text{V/V} + 1 \mu\text{V}$ 14 $\mu\text{V/V} + 2 \mu\text{V}$ 16 $\mu\text{V/V} + 20 \mu\text{V}$ 22 $\mu\text{V/V} + 150 \mu\text{V}$ 22 $\mu\text{V/V} + 1.5 \text{ mV}$	Fluke 5522A
DC Voltage – Measure ³	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1050) V	7 $\mu\text{V/V} + 0.50 \mu\text{V}$ 4.1 $\mu\text{V/V} + 0.40 \mu\text{V}$ 4.1 $\mu\text{V/V} + 4.0 \mu\text{V}$ 5.9 $\mu\text{V/V} + 40.0 \mu\text{V}$ 5.9 $\mu\text{V/V} + 0.53 \text{ mV}$	Fluke 8508A

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
DC Current – Generate ³	(0 to 3.299 99) mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (0 to 11) A	0.030 % + 0.080 μ A 0.030 % + 12 μ A 0.040 % + 31 μ A 0.06 % + 120 μ A 0.06 % + 330 μ A	Fluke 5500A
DC Current –Measure ³	(10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	25 μ A/A + 0.8 nA 23 μ A/A + 5.0 nA 23 μ A/A + 50 nA 37 μ A/A + 0.50 μ A 0.013 % + 10 μ A	Agilent 3458A opt 002

Parameter/Range	Frequency	CMC ^{2, 7} ($\pm$)	Comments
AC Voltage – Generate ³			
(1.0 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	0.11 % + 6 μ V 0.023 % + 6 μ V 0.029 % + 6 μ V 0.13 % + 6 μ V 0.43 % + 12 μ V 0.97 % + 50 μ V	Fluke 5522A
(33 to 329.999) mV	(10 Hz to 45) Hz (45 Hz to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.040 % + 8 μ V 0.018 % + 8 μ V 0.02 % + 8 μ V 0.043 % + 8 μ V 0.097 % + 32 μ V 0.25 % + 70 μ V	
(0.33 to 3.299 99) V	10 Hz 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 μ V 0.019 % + 60 μ V 0.023 % + 60 μ V 0.036 % + 50 μ V 0.085 % + 125 μ V 0.29 % + 600 μ V	
(3.3 to 32.9999) V	10 Hz to 45 Hz (45 Hz to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 650 μ V 0.019 % + 600 μ V 0.029 % + 600 μ V 0.043 % + 600 μ V 0.11 % + 1.6 mV	

Parameter/Range	Frequency	CMC ^{2, 7} ($\pm$)	Comments
AC Voltage – Generate ³ (cont)			
(33 to 329.999) 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	Fluke 5522A
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.037 % + 10 mV 0.03 % + 10 mV 0.037 % + 10 mV	
AC Voltage – Measure ³			
Up to 200 mV	(1 to 10) Hz (10 to 100) Hz 100 Hz to 10 kHz (10 kHz to 30) kHz (30 to 100) kHz	0.026 % + 14 μ V 0.021 % + 4.0 μ V 0.02 % + 4 μ V 0.07 % + 8 μ V 0.96 % + 20 μ V	Fluke 8508A
200 mV to 2 V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz	0.026 % + 14 μ V 0.012 % + 20 μ V 0.015 % + 20 μ V 0.01 % + 20 μ V 0.02 % + 20 μ V 0.03 % + 40 μ V 0.06 % + 40 μ V 0.31 % + 2 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz	0.024 % + 120 μ V 0.012 % + 20 μ V 0.015 % + 20 μ V 0.01 % + 20 μ V 0.02 % + 200 μ V 0.03 % + 40 μ V 0.06 % + 40 μ V 0.31 % + 2 mV	
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz	0.024 % + 12 mV 0.012 % + 2 mV 0.011 % + 2 mV 0.01 % + 2 mV 0.02 % + 2 mV 0.03 % + 4 mV 0.07 % + 20 mV 0.47 % + 0.2 V	

Parameter/Range	Frequency	CMC ^{2,7} ($\pm$)	Comments
AC Voltage – Measure ³ (cont) (200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.025 % + 74 mV 0.02 % + 21 mV 0.015 % + 21 mV 0.036 % + 42 mV 0.091 % + 0.21 V	Fluke 8508A
AC Current – Generate ³ (29 to 329.99) μ A (.33 to 3.2999) mA (3.3 to 32.9999) mA (33 to 329.99) mA (.33 to 1.099 99) A (1.1 A to 2.999 99) A	 (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 (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 (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 (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.25 % + 0.10 μ A 0.18 % + 0.1 μ A 0.16 % + 0.1 μ A 0.37 % + 0.15 μ A 0.97 % + 0.20 μ A 1.9 % + 0.40 μ A 0.24 % + 0.15 μ A 0.15 % + 0.15 μ A 0.13 % + 0.15 μ A 0.25 % + 0.20 μ A 0.60 % + 0.30 μ A 1.2 % + 0.60 μ A 0.22 % + 2.0 μ A 0.11 % + 2.0 μ A 0.050 % + 2.0 μ A 0.10 % + 2.0 μ A 0.25 % + 3.0 μ A 0.49 % + 4.0 μ A 0.22 % + 20 μ A 0.11 % + 20 μ A 0.05 % + 20 μ A 0.15 % + 50 μ A 0.25 % + 100 μ A 0.49 % + 200 μ A 0.22 % + 100 μ A 0.063 % + 100 μ A 0.73 % + 1.0 mA 3.0 % + 5.0 mA 0.22 % + 100 μ A 0.08 % + 100 μ A 0.73 % + 1.0 mA 3.0 % + 5.0 mA	Fluke 5522A

Parameter/Range	Frequency	CMC ^{2, 7} ($\pm$)	Comments
AC Current – Generate ³ (cont)			
(3 to 10.9999) A	45 Hz to 1 kHz (1 to 5) kHz	0.13 % + 2.0 mA 3.6 % + 2.0 mA	Fluke 5522A
(11 to 20.5) A	45 Hz to 1 kHz (1 to 5) kHz	0.19 % + 5.0 mA 3.6 % + 5.0 mA	
AC Current – Measure ³			
(0 to 200) μ A	1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.067 % + 20 nA 0.20 % + 20 nA 0.44 % + 20 nA	Fluke 8508A
200 μ A to 2 mA	1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.033 % + 0.2 μ A 0.088 % + 0.2 μ A 0.47 % + 0.2 μ A	
(2 to 20) mA	1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.033 % + 2 μ A 0.072 % + 2 μ A 0.47 % + 2 μ A	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.049 % + 20 μ A 0.031 % + 20 μ A 0.098 % + 20 μ A	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.063 % + 0.2 mA 0.074 % + 0.2 mA 0.3 % + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.085 % + 2 mA 0.26 % + 2 mA	

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Resistance – Generate ³	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω 110 Ω to 1.099 99 k Ω (1.1 to 10.9999) k Ω (11 to 109.9999) k Ω	54 $\mu\Omega/\Omega + 0.001 \Omega$ 52 $\mu\Omega/\Omega + 0.0015 \Omega$ 35 $\mu\Omega/\Omega + 0.0014 \Omega$ 35 $\mu\Omega/\Omega + 0.002 \Omega$ 35 $\mu\Omega/\Omega + 0.02 \Omega$ 36 $\mu\Omega/\Omega + 0.2 \Omega$	Fluke 5522A, 4-wire
	110 k Ω to 1.0999 M Ω (1.1 to 3.2999) M Ω (3.3 to 10.9999) M Ω (11 to 32.9999) M Ω (33 to 109.9999) M Ω (110 to 329.999) M Ω (330 to 1100) M Ω	40 $\mu\Omega/\Omega + 2 \Omega$ 74 $\mu\Omega/\Omega + 30 \Omega$ 0.016 % + 50 Ω 0.032 % + 2.5 k Ω 0.062 % + 3 k Ω 0.37 % + 100 k Ω 1.8 % + 500 k Ω	Fluke 5522A, 2-wire
Fixed Points	0.001 Ω 0.01 Ω 1 Ω 100 Ω 1000 Ω	2.1 $\mu\Omega$ 1.2 $\mu\Omega$ 15 $\mu\Omega$ 1.5 m Ω 15 m Ω	L & N resistors
Resistance – Measure ³	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω 200 M Ω to 2 G Ω (2 to 20) G Ω	20 $\mu\Omega/\Omega + 4 \mu\Omega$ 12 $\mu\Omega/\Omega + 14 \mu\Omega$ 9.6 $\mu\Omega/\Omega + 50 \mu\Omega$ 9.4 $\mu\Omega/\Omega + 0.5 \text{ m}\Omega$ 9.4 $\mu\Omega/\Omega + 5 \text{ m}\Omega$ 9.4 $\mu\Omega/\Omega + 50 \text{ m}\Omega$ 10.2 $\mu\Omega/\Omega + 1 \Omega$ 25 $\mu\Omega/\Omega + 100 \Omega$ 0.013 % + 10 k Ω 0.16 % + 1 M Ω 0.14 % + 10 M Ω	Fluke 8508A

Parameter/Equipment	Range	CMC ² (±)	Comments
Capacitance – Generate ³	(220.0 to 399.9) pF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) μF (1.1 to 3.299 99) μF (3.3 to 10.9999) μF (11 to 32.9999) μF (33 to 109.999) μF (110 to 329.999) μF (.33 to 1.099 99) mF (1.1 to 3.299 99) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	0.62 % + 10 pF 0.62 % + 0.01 nF 0.62 % + 0.01 nF 0.35 % + 0.1 nF 0.32 % + 0.1 nF 0.32 % + 0.3 nF 0.32 % + 1 nF 0.31 % + 3 nF 0.31 % + 10 nF 0.49 % + 30 nF 0.56 % + 100 nF 0.56 % + 300 nF 0.57 % + 1 μF 0.56 % + 3 μF 0.56 % + 10 μF 0.91 % + 30 μF 1.3 % + 100 μF	Fluke 5522A
Electrical Calibration of Thermocouples & Thermocouple Indicating Systems ³			
Type B	(600 to 800) °C (800 to 1820) °C	0.54 °C 0.44 °C	Fluke 5522A
Type C	(0 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.41 °C 0.62 °C 1.02 °C	
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.61 °C 0.22 °C 0.28 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.34 °C 0.22 °C 0.19 °C 0.23 °C 0.29 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.41 °C 0.24 °C 0.22 °C 0.33 °C 0.49 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.47 °C 0.34 °C 0.25 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples & Thermocouple Indicating Systems ³ (cont)			
Type N	(-200 to -100) °C (-100 to 410) °C (410 to 1300) °C	0.51 °C 0.21 °C 0.36 °C	Fluke 5522A
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.71 °C 0.45 °C 0.51 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.59 °C 0.47 °C 0.57 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.77 °C 0.31 °C 0.22 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.69 °C 0.36 °C	
Electrical Calibration of RTD Indicating Systems ³ —			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.069 °C 0.092 °C 0.11 °C 0.12 °C 0.15 °C 0.28 °C	Fluke 5522A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.069 °C 0.092 °C 0.11 °C 0.12 °C 0.15 °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	0.31 °C 0.061 °C 0.063 °C 0.074 °C 0.086 °C 0.098 °C 0.11 °C 0.12 °C 0.28 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicating Systems ³ – (cont)			
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.059 °C 0.071 °C 0.15 °C 0.16 °C 0.17 °C 0.19 °C	Fluke 5522A
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.059 °C 0.071 °C 0.074 °C 0.10 °C 0.10 °C 0.14 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.049 °C 0.061 °C 0.063 °C 0.074 °C 0.086 °C 0.28 °C	
PtNi 385, 120 Ω (Ni120)	(-80 to 100) °C (100 to 260) °C	0.11 °C 0.17 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.36 °C	

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6, 8} (±)	Comments
Pressure – Measuring Equipment ³	(0 to 30) psi (0 to 100) psi (0 to 300) psi (0 to 5000) psi (0 to 10 000) psi Up to 10 000 psi	0.096 psi 0.098 psi 0.21 psi 0.4 psi 1.7 psi 16 psi	Multifunction calibrator Deadweight tester
Vacuum – Measuring Equipment ³	(-30 to 0) in Hg	0.030 in Hg	Multifunction calibrator

Parameter/Equipment	Range	CMC ^{2, 4, 6, 8} (±)	Comments
Torque Wrenches ³	(4 to 50) lbs·in (30 to 250) lbs·in (80 to 1000) lbs·in (50 to 250) lbs·ft	0.65 lbs·in 0.68 lbs·in 0.72 lbs·in 0.73 lbs·ft	Torque transducers
Torque Transducers ³	(0.5 to 50) lbf·in (50 to 250) lbf·in (250 to 1000) lbf·in (0.5 to 250) lbf·ft	0.81 % 0.18 % 0.51 % 0.20 %	Torque arms & masses
Force Gages ³ – Tension & Compression	(0.2 to 10) lbf (10 to 100) lbf (100 to 500) lbf	0.07 % IV 0.062 % IV 0.022 % IV	Weights
Speed ³ – Measure Optic/Non-Contact: RPM Totalizer/Rate Contact: RPM Totalizer/Rate Meters	 (6 to 200 000) rpm (2 to 3300) fpm (6 to 20 000) rpm (2 to 3300) fpm	 0.16 % 0.16 % 0.23 % 0.23 %	 True meter w/Monarch PLT200
Speed ³ – Simulation RPM Rate	 (6 to 20 000) rpm (2 to 3300) fpm	 0.003 % 0.003 %	 Agilent 33250A
Totalize Meters ³ – (Length Counters & Totalizers) Distance Measure	 Up to 550 yards	 0.61 %	 True meter w/Monarch PLT200
Mass – Measure	Up to 5 g (5 to 50) g (50 to 200) g (201 to 20 000) g	4.2 µg (0.02 + 0.0038M) mg (0.01 + 0.0032M) mg (0.48 + 0.007M) mg	Scales w/ std weights

Parameter/Equipment	Range	CMC ^{2, 4, 6, 8} ($\pm$)	Comments
Scales and Balances ³	Up to 1000 lbs	0.018 % +0.6R	Class 6 weights
	1 g	0.002 mg	ASTM Class 1 weights (applied loads)
	2 g	0.023 mg	
	5 g	0.042 m	
	10 g	0.065 mg	
	20 g	0.067 mg	
	50 g	0.013 mg	
	100 g	0.22 mg	
	200 g	0.49 mg	
	(200 to 500) g	0.80 mg	
	(1 to 2) kg	18 mg	
	(2 to 5) kg	19 mg	
	(5 to 20) kg	150 mg	

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 4, 6, 8} ($\pm$)	Comments
Relative Humidity – Measuring Equipment, Fixed Points ³	11 % RH 33 % RH 53 % RH 75.5 % RH 90 % RH	1.4 % RH	Rotronic HygroPalm/ saturated salts
Relative Humidity – Measure ³	(10 to 90) % RH	1.4 % RH	Rotronic HygroPalm
Temperature / Humidity Recorders ³	(-73 to 190) °C (11 to 90) % RH	0.45 °C 1.4 % RH	Rotronic HygroPalm
Temperature – Measure Ovens, Furnaces, & Freezers ³	(-200 to -60) °C (-60 to -40) °C (-40 to 0) °C (0 to 100) °C (100 to 400) °C	0.065 °C 0.053°C 0.038°C 0.11°C 0.1°C	Fluke 1523 w/ PRT w/ indicator

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Temperature – IR Measuring Equipment ³	(35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.64 °C 0.78 °C 1.0 °C 1.8 °C	Fluke 4181

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Frequency Measure	10 Hz to 1 MHz	0.091 μ Hz/Hz	53181AnW/ option 010
	Up to 225 MHz	0.1 μ Hz/Hz	8508A
Stop Watches/Time Measurement ³	Up to 24 hours	0.35 s	Comparison

¹ This laboratory offers commercial dimensional testing/calibration and on-site calibration services.

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. Field calibration service is available for MSI-Viking Gage, LLC under their ISO/IEC 17025: 2017 accredited Duncan location, certificate 1387.01. Please review the corresponding scope of accreditation for specific calibration parameters that are performed in the field.

⁴ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches or millimeters. DL is the diagonal length in inches or millimeters. R is the resolution of the unit under test. D is the numerical value of the nominal diameter of the device measured in inches or millimeters. Pitch diameter is measured by the three-wire method. Major diameter is calibrated by direct measurement. In the statement of CMC, T indicates temperature in degrees Celsius. In the statement of CMC, H is the Humidity of the reading. In the statement of CMC, M is the applied mass in mg.

⁵ 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.

⁶ In the statement of CMC, a percent refers to a percentage of reading unless otherwise noted.

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 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.

⁹ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

MSI-VIKING GAGE

Durham, North Carolina

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 16th day of December 2021.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1387.05
Valid to May 31, 2024
Revised April 29, 2024

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