



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: April 30, 2019

Certificate Number: 0117.04

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Bore Mics	Up to 2.8 in (2.8 to 10) in	64 µin 72 µin	Ring gages
Gage Blocks	Up to 3 in 4 in (5 to 20) in	3.9 µin 4.6 µin (4.0 + 1.4L) µin	Mechanical comparison with reference blocks
Length Standards	(1 to 72) in	(36 + 1.3L) µin	ULM
Calipers ³	(4 to 120) in	(7.3 + 6.2L + 0.60R) µin	Gage blocks
Center Punches or Gage Markers	Up to 8 in	530 µin	Optical Comparator
Micrometers – Outside ³	Up to 1 in (>1 to 6) in (>6 to 24) in	60 µin (51 + 9.4L) µin (79 + 8.3L) µin	Gage blocks
Outside	(>24 to 65) in	0.0015 in	
Disc Micrometers	Up to 1 in	130 µin	ULM
Inside Micrometers	Up to 40 in	(60 + 2.0L) µin	

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments ⁵
Height Gages ³	(1 to 24) in (>24 to 48) in	(37 + 1.5L) μ in (29 + 9.2L + 0.60R) μ in	Gage block, surface plate
Hex Plugs	Up to 1 in Corner to Corner Flat to Flat	41 μ in 28 μ in	ULM, Pratt and Whitney Supermicrometer®
Indicators – Dial/Digital ³	Up to 6 in	(35 + 0.60R) μ in	Gage blocks
Laser Micrometers	Up to 2 in	20 μ in	Class XXX pin
Surveillance Masters: Micrometer Set Master	Up to 6 in (>6 to 12) in	31 μ in 65 μ in	ULM
Depth/Caliper Micrometer Master	Up to 12 in	(30 + 0.5L) μ in	Gage Head, gage blocks and surface plate
Optical Comparators ³ –			
Linearity	Up to 12 in	(140 + 0.60R) μ in	Reticle and inspection scale
Magnification	10X to 100X	(760 + 0.60R) μ in	
Angularity	(0 to 360)°	2' 8"	
Pin Gages	Up to 1 in	22 μ in	ULM, Pratt and Whitney Supermicrometer®
Plugs	Up to 1.5 in (>1.5 to 3.0)	13 μ in 16 μ in	ID comparator
Radius Gages	Up to 1 in (>1 to 2) in	130 μ in 150 μ in	Video measuring machine

Parameter/Equipment	Range	CMC ² (±)	Comments ⁵
Threaded Plugs – Major Diameter Pitch Diameter	Up to 3.5 in (>3.5 to 10) in Up to 1.5 in (>1.5 to 3.5) in (>3.5 to 10) in	40 µin 170 µin 100 µin 160 µin 280 µin	ULM and Pratt and Whitney Supermicrometer®
Thread Wires	Up to 0.26 in	19 µin	ULM
Plain Rings	0.04 to 1.5 in (>1.5 to 3.0) in (>3.0 to 10.0) in	17 µin 24 µin 40 µin	Comparator
Adjustable Thread Rings Minor Diameter Pitch Diameter	Up to 0.425 in (>0.425 to 2.8) in (>2.8 to 6.6) in Up to 1.5 in (>1.5 to 3.5) in (>3.5 to 6.5) in	98 µin 110 µin 530 µin 140 µin 180 µin 190 µin	Bore gage Video measuring machine Set plug
Tapered Thread Rings – Standoff L1 Length	Up to 6 in Up to 6 in	0.00021 in 0.00010 in	Gage blocks
Tapered Thread Plugs – Pitch Diameter L1 Length	Up to 6 in Up to 6 in	0.00010 in 0.00010 in	Gage blocks, Pratt and Whitney Supermicrometer® and thread wires
Tri Roll Elements and Bi Element Segments	(4 to 80) TPI	0.0002 in	Overlays, optical comparator

Parameter/Equipment	Range	CMC ² (±)	Comments
Reticles	Up to 1 in (>1 to 6) in (>6 to 12) in (0 to 25.4) mm (>25.4 to 152.4) mm (>152.4 to 304.8) mm	80 μin 90 μin 100 μin 0.0021 mm 0.0024 mm 0.0026 mm	Vision system
Surface Plates ³ – Flatness Repeat	(16 to 195) in Diagonal	6 √Dia 23 μin	Electronic levels repeat-o-meter Dia is diagonal in inches
Bench Micrometers, Pratt and Whitney Supermicrometer® ^{3,5}	Up to 2 in	20 μin	Gage blocks
Rules	Up to 18 in (>18 to 78) in	0.00050 in 0.0031 in	Gage blocks, vision system

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
DC Voltage ³ – Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	5.0 μV/V + 100 nV 3.6 μV/V + 400 nV 3.6 μV/V + 4.0 μV 5.6 μV/V + 40 μV 5.6 μV/V + 500 μV	Fluke 8508A
DC Voltage ³ – Generate	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	21 μV/V + 1.0 μV 11 μV/V + 2.0 μV 12 μV/V + 20 μV 18 μV/V + 150 μV 18 μV/V + 1.5 mV	Fluke 5520A
DC Current ³ – Measure	Up to 200 μA 200 μA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	13 μA/A + 0.40 nA 12 μA/A + 4.0 nA 14 μA/A + 40 nA 48 μA/A + 0.80 μA 0.019 % + 16 μA 0.041 % + 0.40 mA	Fluke 8508A

Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
DC Current ³ – Generate	(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 3.0) A (3 to 11) A (11 to 20.5) A	0.015 % + 0.020 μ A 0.010 % + 0.050 μ A 0.010 % + 0.25 μ A 0.010 % + 2.5 μ A 0.020 % + 40 μ A 0.038 % + 40 μ A 0.050 % + 500 μ A 0.10 % + 750 μ A	Fluke 5520A
Clamp-On Only	(20 to 50) A (>50 to 1025) A	12 % output + 0.14 A 5.0 % output + 0.50 A	Fluke 5500A/coil and Fluke 5520A
DC Resistance ³ – Measure	Up 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	20 $\mu\Omega/\Omega$ + 4.0 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 14 $\mu\Omega$ 9.0 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 9.0 $\mu\Omega/\Omega$ + 0.50 m Ω 9.0 $\mu\Omega/\Omega$ + 5.0 m Ω 12 $\mu\Omega/\Omega$ + 50 m Ω 91 $\mu\Omega/\Omega$ + 1.0 Ω 33 $\mu\Omega/\Omega$ + 100 Ω 0.027 % + 10 k Ω 0.16 % + 1.0 M Ω	Fluke 8508A
Electrical Simulation of RTDs ³ –			
Pt 385, 100 Ω	(-200 to 0) $^{\circ}$ C (0 to 100) $^{\circ}$ C (100 to 300) $^{\circ}$ C (300 to 400) $^{\circ}$ C (400 to 630) $^{\circ}$ C (630 to 800) $^{\circ}$ C	0.040 $^{\circ}$ C 0.050 $^{\circ}$ C 0.070 $^{\circ}$ C 0.080 $^{\circ}$ C 0.090 $^{\circ}$ C 0.18 $^{\circ}$ C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to 0) $^{\circ}$ C (0 to 100) $^{\circ}$ C (100 to 300) $^{\circ}$ C (300 to 400) $^{\circ}$ C (400 to 630) $^{\circ}$ C	0.040 $^{\circ}$ C 0.050 $^{\circ}$ C 0.070 $^{\circ}$ C 0.080 $^{\circ}$ C 0.090 $^{\circ}$ C	
Pt 3916, 100 Ω	(-200 to -190) $^{\circ}$ C (-190 to -80) $^{\circ}$ C (-80 to 0) $^{\circ}$ C (0 to 100) $^{\circ}$ C (100 to 260) $^{\circ}$ C (260 to 300) $^{\circ}$ C (300 to 400) $^{\circ}$ C (400 to 600) $^{\circ}$ C (600 to 630) $^{\circ}$ C	0.19 $^{\circ}$ C 0.030 $^{\circ}$ C 0.040 $^{\circ}$ C 0.050 $^{\circ}$ C 0.050 $^{\circ}$ C 0.060 $^{\circ}$ C 0.070 $^{\circ}$ C 0.080 $^{\circ}$ C 0.18 $^{\circ}$ C	

Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
DC Resistance ³ – Generate	(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	41 $\mu\Omega/\Omega$ + 0.010 Ω 30 $\mu\Omega/\Omega$ + 0.015 Ω 28 $\mu\Omega/\Omega$ + 0.015 Ω 28 $\mu\Omega/\Omega$ + 0.020 Ω 28 $\mu\Omega/\Omega$ + 0.020 Ω 28 $\mu\Omega/\Omega$ + 0.20 Ω 28 $\mu\Omega/\Omega$ + 0.10 Ω 28 $\mu\Omega/\Omega$ + 1.0 Ω 28 $\mu\Omega/\Omega$ + 1.0 Ω 32 $\mu\Omega/\Omega$ + 10 Ω 32 $\mu\Omega/\Omega$ + 10 Ω 0.011 % + 150 Ω 0.016 % + 250 Ω 0.026 % + 2.5 k Ω 0.051 % + 3.0 k Ω 0.30 % + 100 k Ω 1.5 % + 500 k Ω	Fluke 5520A
Electrical Simulation of Thermocouples ³ –			
Type E	(-250 to -100) $^{\circ}\text{C}$ (-100 to -25) $^{\circ}\text{C}$ (-25 to 350) $^{\circ}\text{C}$ (350 to 650) $^{\circ}\text{C}$ (650 to 1000) $^{\circ}\text{C}$	0.45 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.28 $^{\circ}\text{C}$	Fluke 5520A
Type J	(-210 to -100) $^{\circ}\text{C}$ (-100 to -30) $^{\circ}\text{C}$ (-30 to 150) $^{\circ}\text{C}$ (150 to 760) $^{\circ}\text{C}$ (760 to 1200) $^{\circ}\text{C}$	0.31 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.27 $^{\circ}\text{C}$ 0.29 $^{\circ}\text{C}$	
Type K	(-200 to -100) $^{\circ}\text{C}$ (-100 to -25) $^{\circ}\text{C}$ (-25 to 120) $^{\circ}\text{C}$ (120 to 1000) $^{\circ}\text{C}$ (1000 to 1372) $^{\circ}\text{C}$	0.35 $^{\circ}\text{C}$ 0.27 $^{\circ}\text{C}$ 0.26 $^{\circ}\text{C}$ 0.31 $^{\circ}\text{C}$ 0.39 $^{\circ}\text{C}$	
Type R	(0 to 250) $^{\circ}\text{C}$ (250 to 400) $^{\circ}\text{C}$ (400 to 1000) $^{\circ}\text{C}$ (1000 to 1767) $^{\circ}\text{C}$	0.50 $^{\circ}\text{C}$ 0.36 $^{\circ}\text{C}$ 0.37 $^{\circ}\text{C}$ 0.39 $^{\circ}\text{C}$	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouples ³ –			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.43 °C 0.36 °C 0.37 °C 0.43 °C	Fluke 5520A
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.54 °C 0.30 °C 0.26 °C 0.26 °C	

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Voltage ³ – Measure			
Up to 200 mV	(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	0.018 % + 14 µV 0.015 % + 4.0 µV 0.013 % + 4.0 µV 0.013 % + 2.0 µV 0.014 % + 4.0 µV 0.034 % + 8.0 µV 0.077 % + 20 µV	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 300 kHz to 1 MHz	0.016 % + 120 µV 0.013 % + 20 µV 97 µV/V + 20 µV 83 µV/V + 20 µV 0.011 % + 20 µV 0.022 % + 40 µV 0.057 % + 200 µV 0.32 % + 2.0 mV 1.1 % + 20 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 300 kHz to 1 MHz	0.015 % + 1.2 mV 0.012 % + 200 µV 91 µV/V + 200 µV 76 µV/V + 200 µV 0.011 % + 200 µV 0.022 % + 400 µV 0.057 % + 2.0 mV 0.30 % + 20 mV 1.0 % + 200 mV	

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Voltage ³ – Measure (cont)			
(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 300 kHz to 1 MHz	0.015 % + 12 mV 0.012 % + 2.0 mV 90 µV/V + 2.0 mV 75 µV/V + 2.0 mV 0.011 % + 2.0 mV 0.023 % + 4.0 mV 0.057 % + 20 mV 0.31 % + 200 mV 1.0 % + 2.0 V	Fluke 8508A
(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	0.016 % + 70 mV 0.012 % + 20 mV 0.013 % + 20 mV 0.023 % + 40 mV 0.059 % + 200 mV	
AC Voltage ³ – Generate			
(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	0.081 % + 6.0 µV 0.016 % + 6.0 µV 0.021 % + 6.0 µV 0.10 % + 6.0 µV 0.35 % + 12 µV 0.80 % + 50 µV	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	0.031 % + 8.0 µV 0.016 % + 8.0 µV 0.016 % + 8.0 µV 0.035 % + 8.0 µV 0.080 % + 32 µV 0.20 % + 70 µV	
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.031 % + 50 µV 0.016 % + 60 µV 0.019 % + 60 µV 0.030 % + 50 µV 0.071 % + 130 µV 0.24 % + 600 µV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.030 % + 650 µV 0.015 % + 600 µV 0.024 % + 600 µV 0.035 % + 600 µV 0.090 % + 1.6 mV	

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Voltage ³ – Generate (33 to 330) V (330 to 1020) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.019 % + 2.0 mV 0.020 % + 6.0 mV 0.026 % + 6.0 mV 0.030 % + 6.0 mV 0.20 % + 50 mV 0.031 % + 10 mV 0.026 % + 10 mV 0.031 % + 10 mV	Fluke 5520A
AC Current ³ – Measure Up to 200 µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz 10 Hz to 2 kHz (2 to 10) kHz	0.058 % + 20 nA 0.058 % + 20 nA 0.074 % + 20 nA 0.40 % output + 20 nA 0.046 % + 200 nA 0.031 % + 200 nA 0.072 % + 200 nA 0.40 % output + 200 nA 0.035 % + 2.0 µA 0.031 % + 2.0 µA 0.072 % + 2.0 µA 0.40 % output + 2.0 µA 0.032 % + 20 µA 0.030 % + 20 µA 0.063 % + 20 µA 0.063 % + 200 µA 0.074 % + 200 µA 0.30 % output + 200 µA 0.083 + 2.0 mA 0.25 % output + 2.0 mA	Fluke 8508A

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Current ³ – Generate			
(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	0.27 % output + 0.10 µA 0.23 % output + 0.10 µA 0.22 % output + 0.10 µA 0.35 % output + 0.15 µA 0.82 % output + 0.20 µA 1.7 % output + 0.40 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	0.20 % output + 0.15 µA 0.13 % output + 0.15 µA 0.11 % output + 0.15 µA 0.20 % output + 0.20 µA 0.50 % output + 0.30 µA 1.0 % output + 0.60 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 % output + 2.0 µA 0.090 % output + 2.0 µA 0.040 % output + 2.0 µA 0.080 % output + 2.0 µA 0.20 % output + 3.0 µA 0.40 % output + 4.0 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 % output + 20 µA 0.090 % output + 20 µA 0.040 % output + 20 µA 0.10 % output + 50 µA 0.20 % output + 100 µA 0.40 % output + 200 µA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % output + 100 µA 0.050 % output + 100 µA 0.60 % output + 1.0 mA 2.5 % output + 5.0 mA	

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Current ³ – Generate (cont)			
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % output + 100 µA 0.060 % output + 100 µA 0.60 % output + 1.0 mA 2.5 % output + 5.0 mA	Fluke 5520A
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.060 % output + 2.0 mA 0.10 % output + 2.0 mA 3.0 % output + 2.0 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % output + 5.0 mA 0.15 % output + 5.0 mA 3.0 % output + 5.0 mA	
(20.5 to 55) A	(45 to 65) Hz (65 to 440) Hz	3.3 % output + 0.25 A 9.2 % output + 0.25 A	Fluke 5500A coil and Fluke 5520A
(55 to 150) A	(45 to 65) Hz (65 to 440) Hz	9.7 % output + 0.25 A 8.5 % output + 0.25 A	
(150 to 550) A	(45 to 440) Hz	4.3 % output + 1.0 A	Fluke 5500A coil and Fluke 5520A
(550 to 1025) A	(45 to 440) Hz	7.8 % output + 1.0 A	
Capacitance ³ – Generate	(0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 32.9999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.09999) µF (1.1 to 3.29999) µF (3.3 to 10.9999) µF (11 to 32.9999) µF (33 to 109.999) µF (110 to 329.999) µF (0.33µF to 1.09999) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	2.8 % + 0.01 nF 1.1 % + 0.01 nF 0.53 % + 0.01 nF 0.20 % + 0.01 nF 0.19 % + 0.1 nF 0.19 % + 0.1 nF 0.19 % + 0.2 nF 0.22 % + 1 nF 0.19 % + 2 nF 0.19 % + 8 nF 0.31 % + 23 nF 0.35 % + 78 nF 0.35 % + 230 nF 0.35 % + 1 µF 0.35 % + 2 µF 0.35 % + 8 µF 0.58 % + 23 µF 0.85 % + 78 µF	Fluke 5520A

III. Mechanical

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Balances and Scales ³	Up to 1 mg (>1 to 50) mg (>50 to 500) mg >500 mg to 5 g (>5 to 20) g (>20 to 50) g (>50 to 100) g (>100 to 200) g (>200 to 500) g >500 g to 2.5 kg	0.0011 mg 0.0016 mg 0.0029 mg 0.013 mg 0.019 mg 0.16 mg 0.32 mg 0.66 mg 0.83 mg 16 mg	Class 1 weights
	Up to 10 lb (>10 to 50) lb (>50 to 1000) lb	0.00018 lb 0.00097 lb 0.024 lb	Class F weights
Deadweight Testers	Up to 20 000 psi	0.04 %	Fluke RPM4
Force ³ – Gages and Cells	Up to 10 lbs (>10 to 100 lbs) (>100 to 500 lbf (500 to 25 000) lbf (>25 000 to 100 000) lbf	0.04 lbf	Dead weight
		0.12 lbf 0.22 lbf 0.12 % 0.25 %	Load cells
Mass	1 mg (>1 to 50) mg (>50 to 500) mg (1 to 5) g (>5 to 20) g (>20 to 50) g (>50 to 100) g (>100 to 200) g (>200 to 500) g >500 g to 4.535 kg (>4.535 to 22.679) kg	0.0018 mg 0.0086 mg 0.0079 mg 0.022 mg 0.034 mg 0.16 mg 0.32 mg 0.67 mg 0.84 mg 0.22 g 0.55 g	Class 1 weights
			Class F weights
Indirect Verification of Rockwell Hardness Testers ³	HRA: (20 to 65) HRA (70 to 78) HRA (80 to 84) HRA HRBW: (40 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW	0.29 HRA 0.19 HRA 0.22 HRA 1.0 HRBW 0.64 HRBW 0.47 HRBW	ASTM E18; ISO EN 6508-2

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ (cont.)	HRC:		ASTM E18; ISO EN 6508-2
	(20 to 30) HRC	0.41 HRC	
	(35 to 55) HRC	0.34 HRC	
	(60 to 65) HRC	0.32 HRC	
	HREW:		
	(74 to 79) HREW	0.45 HREW	
	(84 to 90) HREW	0.58 HREW	
	(93 to 100) HREW	0.56 HREW	
	HRFW:		
	(60 to 75) HRF	0.55 HRF	
	(80 to 90) HRF	0.49 HRF	
	(94 to 100) HRF	0.45 HRF	
	HR15N:		
	(70 to 77) HR15N	0.46 HR15N	
	(78 to 88) HR15N	0.23 HR15N	
	(90 to 92) HR15N	0.23 HR15N	
	HR15TW:		
	(74 to 80) HR15TW	0.47 HR15TW	
	(81 to 86) HR15TW	0.36 HR15TW	
	(87 to 93) HR15TW	0.34 HR15TW	
	HR30N:		
	(42 to 50) HR30N	0.43 HR30N	
	(55 to 73) HR30N	0.34 HR30N	
	(77 to 82) HR30N	0.31 HR30N	
HR30TW:			
(43 to 56) HR30TW	0.57 HR30TW		
(57 to 69) HR30TW	0.35 HR30TW		
(70 to 83) HR30TW	0.32 HR30TW		
HR45N:			
(20 to 31) HR45N	0.47 HR45N		
(37 to 61) HR45N	0.48 HR45N		
(66 to 72) HR45N	0.22 HR45N		
HR45TW:			
(13 to 32) HR45TW	0.64 HR45TW		
(33 to 52) HR45TW	0.64 HR45TW		
(53 to 73) HR45TW	0.42 HR45TW		

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Indirect Verification of Brinell Hardness Testers ³ at Test Conditions –			ASTM E10 ISO EN 6506-2
HBW 10/500/15	(100 to 200) HBW	2.5 HBW	
HBW 10/1000/15	(200 to 300) HBW	3.8 HBW	
HBW 10/1500/15	(300 to 400) HBW	2.9 HBW	
HBW 10/3000/15	(200 to 400) HBW (500 to 600) HBW	3.1 HBW 3.1 HBW	
Indirect Verification of Microindentation Hardness Testers ³			
Vickers	(100 to 240) HV (240 to 600) HV >600 HV	4.3 HV 7.4 HV 16 HV	ASTM E92 ISO EN 6507-2
Knoop	(100 to 250) HK (250 to 650) HK >650 HK	6.4 HK 12 HK 19 HK	ISO EN 4545-2
Indirect Verification of Leeb Hardness Testers ³ , Fixed Point	780 HLD	10 HLD	ASTM A956
Microscopes (Linearity) ³	5X to 100X objective	3.0 μ m	Reticle/stage micrometer
Pressure			
Pneumatic	(Up to 30) psi (>30 to 1000) psi (>1000 to 10 000) psi	0.012 % + 0.60R 0.04 % + 0.60R 0.06 % + 0.60R	Fluke PPC4 module RPM4 module
Hydraulic	(Up to 40 000) psi	0.070 % + 0.60R	RPM4 module
Torque Multipliers	(0 to 6000) ft-lbf	0.35 %	Torque transducers

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Torque Transducers	(5 to 100) in·lbf (10 to 200) ft·lbf (>200 to 2000) ft·lbf	(0.011 + 0.0001 <i>T</i>) in·lbf + 0.60 <i>R</i> (0.008 + 0.0001 <i>T</i>) ft·lbf + 0.60 <i>R</i> (0.016 + 0.0001 <i>T</i>) ft·lbf + 0.60 <i>R</i>	Torque arms, Class F weights
Torque Wrenches	(0 to 100) in·lbf (>100 to 2400) in·lbf (10 to 200) ft·lbf (>200 to 2000) ft·lbf	0.41 in·lbf + 0.60 <i>R</i> (2.4 + 0.0006 <i>T</i>) in·lbf + 0.60 <i>R</i> 1.5 ft·lbf + 0.60 <i>R</i> (1.5 + 0.0013 <i>T</i>) ft·lbf + 0.60 <i>R</i>	Torque calibrator

IV. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Humidity	(10 to 20) % RH (>20 to 90) % RH	1.0 % RH 0.7 % RH	Thunder Scientific 2500
Temperature – Infrared	(-15 to 120) °C (>120 to 200) °C (>200 to 500) °C	0.70 °C 0.90 °C 2.1 °C	Black body
Temperature – Measuring Equipment ³	(-197 to -40) °C (>-40 to 0) °C (>0 to 300) °C (>300 to 400) °C (>400 to 500) °C (>500 to 660) °C	0.39 °C 0.12 °C 0.18 °C 0.35 °C 0.70 °C 0.74 °C	PRT and baths
Temperature – Measure	(-197 to 300) °C (300 to 500) °C (500 to 660) °C	0.01 °C 0.02 °C 0.03 °C	PRT

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Temperature ³ – System Accuracy Test (SAT), Ovens, Furnaces, Freezer	(0 to 1093) °C	1.3 °C + 0.6R	AMS 2750 Fluke 744 with T/C
Temperature ³ – Temperature Uniformity Surveys (TUS), Ovens, Furnaces, Freezers	(0 to 1093) °C (>1093 to 1327) °C	2.1 °C + 0.6R 2.7 °C + 0.6R	AMS2750 Type K TC Fluke 744 DATA PAQ logger

V. Time and Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Stopwatches ³	15 s to 24 hr	0.20 s	NIST website
Frequency ³ – Measuring Equipment	0.01 Hz to 2 MHz	2.0 µHz/Hz + 5.0 µHz	Fluke 5520A
Optical Tachometers	Up to 100 RPM (>100 to 89 000) RPM	0.07 + 0.6R RPM 1.7 + 0.6R RPM	Frequency Counter

¹ This laboratory offers commercial 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 and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. 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 the indicated units. In the Statement of CMC, T is the numerical value of the nominal torque of the device measured in ft·lb or in·lb.

⁵ "Supermicrometer" is a registered trade mark with a last listed owner of Pratt and Whitney Measurement Systems, Inc., Connecticut, U.S.A.

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.



Accredited Laboratory

A2LA has accredited

LABORATORY TESTING, INC.

Hatfield, PA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCCL 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 7th day of September 2017.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 117.04
Valid to April 30, 2019
Revised March 14, 2019

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