



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

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CALIBRATION

Valid To: August 31, 2019

Certificate Number: 1848.01

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

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Meter	4 pH 7 pH 10 pH	0.015 pH 0.017 pH 0.025 pH	Buffer solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Gage Blocks	Up to 1 in (2 to 4) in (5 to 20) in	(4.9 + 2L) μin (5.9 + 2.8L) μin (12 + 3L) μin	By mechanical comparison using universal measuring machine, DMS 680
Length Bars	Up to 24 in	(15 + 3.2L) μin	By mechanical comparison using universal measuring machine, DMS 680

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Plug Gages (OD)	Up to 12 in	(17 + 3.9D) μin	Universal measuring machine, DMS 680
Taper	(0.039 to 5.7) in	5 μin	IAC Masterscanner
Diameter	(0.039 to 5.7) in	(80 + 2L) μin	IAC Masterscanner
Taper Pipe Thread Plugs –			
Effective Pitch Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.039 to 5.7) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.039 to 5.7) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.039 to 5.7) in	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0° 6" 0')/p	IAC Masterscanner, p=Pitch
	Pitch > 0.0394 in (1 mm)	0° 6" 0'	IAC Masterscanner
Taper	(0.039 to 5.7) in	22 μin	IAC Masterscanner



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Taper Pipe Thread Rings –			
Effective Pitch Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.118 to 6) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.118 to 6) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.118 to 6) in	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0° 6" 0')/p	IAC Masterscanner, p=Pitch
	Pitch > 0.0394 in (1 mm)	0° 6" 0'	IAC Masterscanner
Taper	(0.118 to 6) in	22 μin	IAC Masterscanner
Thread Plug Gages and Setting Plug Gages –	(2 to 120) TPI Up to 12 in	(100 + 2D) μin	Universal measuring machine, DMS 680 and thread wires
Effective Pitch Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.039 to 5.7) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.039 to 5.7) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.039 to 5.7) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.039 to 5.7) in	(40 + 5L) μin	IAC Masterscanner
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0° 6" 0')/p	IAC Masterscanner, p=Pitch
	Pitch > 0.0394 in (1 mm)	0° 6" 0'	IAC Masterscanner
Taper	(0.039 to 5.7) in	22 μin	IAC Masterscanner



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Ring Gages (ID)	(0.06 to 12) in	(19 + 2D) μin	Universal measuring machine, DMS 680
Taper	(0.039 to 6) in	5 μin	IAC Masterscanner
Diameter	(0.039 to 6) in	(40 + 2L) μin	IAC Masterscanner
Thread Ring Gages –	Up to 6 in	(100 + 2D) μin	Setting plugs
Effective Pitch Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Simple Pitch Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Major Diameter	(0.118 to 6) in	(80 + 5L) μin	IAC Masterscanner
Minor Diameter	(0.118 to 6) in	(100 + 5L) μin	IAC Masterscanner
Thread Pitch	(0.118 to 6) in	(40 + 5L) μin	IAC Masterscanner
Accumulated Pitch Deviation	(0.118 to 6) in	(40 + 5L) μin	
Flank Angles	Pitch ≤ 0.0394 in (1 mm)	(0° 6" 0')/p	IAC Masterscanner, p=Pitch
	Pitch > 0.0394 in (1 mm)	0° 6" 0'	IAC Masterscanner
Taper	(0.118 to 6) in	22 μin	IAC Masterscanner
Calipers and Verniers ³	Up to 60 in	400 μin	Gage blocks and rod standards
Height Gages ³	Up to 40 in	400 μin	Gage blocks, length rods
Digital Indicators ³	Up to 2 in	67 μin	Gage blocks
Dial and Test Indicators ³	Up to 2 in	70 μin	Gage blocks



Parameter/Equipment	Range ⁴	CMC ^{2,4} (\pm)	Comments
Micrometers ³ –			
Outside	Up to 36 in	(46 + 7L) μ in	Gage blocks and rod standards
Inside	Up to 24 in	(46 + 10L) μ in	Universal measuring machine, DMS 680
Depth	Up to 12 in	95 μ in	Gage blocks
Pin Gages ³	(0.011 to 1) in	(19 + 2D) μ in	Universal measuring machine, DMS 680
Profilometers	117 μ in <i>Ra</i>	3.2 μ in	Roughness specimen
Rules and Tapes ³	Up to 100 ft	0.04 in	Steel rule/optical scale
Optical Comparators and Measuring Machines ³ –			
Axis Linearity	Up to 6 in	160 μ in	Master calibration artifact
Magnification	5x 10x 20x 50x 100x	730 μ in 730 μ in 410 μ in 410 μ in 420 μ in	Magnification checker scale

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,5} (\pm)	Comments
DC Voltage – Generate ³	0 to 330 mV 330 mV to 3.3 V (3.3 to 30) V (30 to 330) V (330 to 1000) V	70 μ V/V + 3 μ V 58 μ V/V + 5 μ V 58 μ V/V + 50 μ V 64 μ V/V + 500 μ V 64 μ V/V + 1.5 mV	Fluke 5500A



Parameter/Equipment	Range	CMC ^{2,5} (\pm)	Comments
DC Voltage – Measure ³	0 to 100 mV 330 mV to 3.3 V (3.3 to 30) V (30 to 330) V (330 to 1000) V	45 μ V/V + 3.5 μ V 30 μ V/V + 7 μ V 28 μ V/V + 50 μ V 45 μ V/V + 600 μ V 48 μ V/V + 10 mV	Fluke 8846A
DC Current – Generate ³	0 to 2.2 mA (2.2 to 3.3) mA (3.3 to 11) mA (11 to 33) mA (33 to 330) mA 330 mA to 2.1 A (2.1 to 11) A	0.017 % + 0.05 μ A 0.023 % + 0.05 μ A 0.012 % + 0.25 μ A 0.012 % + 0.25 μ A 41 μ A/A + 3.3 μ A 0.036 % + 44 μ A 0.074 % + 330 μ A	Fluke 5500A
DC Current – Measure ³	0 to 100 μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 3) A (3 to 10) A (10 to 100) A (100 to 1000) A	0.059 % + 25 nA 0.059 % + 50 nA 0.058 % + 2 μ A 0.058 % + 5 μ A 0.58 % + 200 μ A 0.12 % + 600 μ A 0.18 % + 800 μ A 0.56 % + 3.5 μ A 1.3 % + 3.5 μ A	Fluke 8846A Fluke 8846A with Empro shunts
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	0.015 % + 8 m Ω 0.014 % + 15 m Ω 0.011 % + 15 m Ω 0.011 % + 15 m Ω 0.011 % + 60 m Ω 0.011 % + 60 m Ω 0.011 % + 0.6 Ω 0.032 % + 0.6 Ω 0.013 % + 6 Ω 0.014 % + 6 Ω 0.024 % + 55 Ω 0.019 % + 55 Ω 0.075 % + 550 Ω 4 m Ω / Ω + 550 Ω 6 m Ω / Ω + 5.5 k Ω 0.6 % + 17 k Ω	Fluke 5500A



Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Resistance – Measure ³	0 to 10 Ω 10 to 100 Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	0.012 % + 3 mΩ 0.012 % + 4 mΩ 0.012 % + 10 mΩ 0.012 % + 0.1 Ω 0.012 % + 1 Ω 0.012 % + 10 Ω 0.012 % + 100 Ω 0.93 % + 10 kΩ 0.78 % + 100 kΩ	Fluke 8846A
Electrical Calibration of RTD Indicators and Indicating System ³ –			
Pt 385, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.058 °C 0.058 °C 0.081 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	Fluke 5500A
Pt 3926, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.058 °C 0.058 °C 0.081 °C 0.11 °C 0.11 °C 0.27 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.29 °C 0.046 °C 0.046 °C 0.069 °C 0.081 °C 0.092 °C 0.11 °C 0.12 °C 0.27 °C	
Pt 385, 200 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.046 °C 0.046 °C 0.046 °C 0.059 °C 0.14 °C 0.15 °C 0.17 °C 0.19 °C	



Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicators and Indicating System ³ –			
Pt 385, 500 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.047 °C 0.058 °C 0.058 °C 0.069 °C 0.092 °C 0.092 °C 0.11 °C 0.13 °C	Fluke 5500A
Pt 385, 1000 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.035 °C 0.034 °C 0.046 °C 0.058 °C 0.069 °C 0.081 °C 0.081 °C 0.27 °C	
PtNi 385, 120 Ω	-80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C	0.092 °C 0.092 °C 0.17 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.35 °C	
Electrical Calibration of Thermocouple Indicators and Indicating Systems ³ –			
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.60 °C 0.23 °C 0.22 °C 0.23 °C 0.28 °C	Fluke 5500A
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.34 °C 0.22 °C 0.22 °C 0.23 °C 0.30 °C	



Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems ³ – (cont)			
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.41 °C 0.25 °C 0.22 °C 0.23 °C 0.49 °C	Fluke 5500A
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.67 °C 0.45 °C 0.41 °C 0.49 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.55 °C 0.45 °C 0.47 °C 0.65 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.76 °C 0.30 °C 0.24 °C 0.22 °C	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
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	0.5 % + 20 μV 0.17 % + 20 μV 0.23 % + 20 μV 0.29 % + 20 μV 0.4 % + 33 μV 1.2 % + 60 μV	Fluke 5500A
(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	0.3 % + 50 μV 0.059 % + 20 μV 0.12 % + 20 μV 0.18 % + 40 μV 0.28 % + 170 μV 0.81 % + 330 μV	



Parameter/Range	Frequency	CMC ^{2, 5} (\pm)	Comments
AC Voltage – Generate ³ (cont.)			
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	0.17 % + 250 μ V 0.036 % + 60 μ V 0.093 % + 60 μ V 0.16 % + 300 μ V 0.28 % + 1.7 mV 0.53 % + 3.3 mV	Fluke 5500A
(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	0.17 % + 2.5 mV 0.047 % + 600 μ V 0.093 % + 2.6 mV 0.22 % + 5 mV 0.28 % + 17 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.058 % + 6.6 mV 0.093 % + 15 mV 0.11 % + 33 mV	
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.059 % + 80 μ V 0.23 % + 100 μ V 0.23 % + 500 mV	
AC Voltage – Measure ³			
0 to 1000 V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	1.2 % + 0.03 V 0.4 % + 0.03 V 0.07 % + 0.03 V 0.14 % + 0.05 V 0.7 % + 0.08 V 4.7 % + 0.5 V	Fluke 8846A
AC Current – Generate ³			
(29 to 330) μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA	20 Hz to 1 kHz	0.15 % + 0.25 μ A 0.12 % + 0.3 μ A 0.11 % + 3 μ A 0.11 % + 30 μ A	Fluke 5500A
330 mA to 2.2 A	45 Hz to 1 kHz	0.12 % + 300 μ A	
(2.2 to 11) A	500 Hz to 1 kHz	3.8 mA/A + 2 mA	
(11 to 500) A	(50 to 60) Hz	0.20 %	Fluke 5500A plus coil, clamp-on only



Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current – Measure ³			
(5 to 100) µA	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.2 % + 40 nA 0.35 % + 40 nA 0.12 % + 40 nA 0.24 % + 250 nA	Fluke 8846A
100 µA to 1 mA	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.2 % + 400 nA 0.35 % + 400 nA 0.12 % + 400 nA 0.24 % + 2.5 µA	
(1 to 10) mA	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.2 % + 4 µA 0.35 % + 4 µA 0.12 % + 4 µA 0.23 % + 25 µA	
(10 to 100) mA	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.2 % + 40 µA 0.35 % + 40 µA 0.12 % + 40 µA 0.24 % + 250 µA	
100 mA to 1 A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.2 % + 400 µA 0.35 % + 400 µA 0.12 % + 400 µA 0.41 % + 700 µA	
(1 to 3) A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.3 % + 1.8 mA 0.41 % + 1.8 mA 0.18 % + 1.8 mA 0.41 % + 2.1 mA	
(3 to 10) A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz (5 to 10) kHz	1.3 % + 6 mA 0.41 % + 6 mA 0.18 % + 6 mA 0.41 % + 70 mA	



IV. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Brinell Hardness Testers ³	HBW 10/500 (15.9 to 109)	4.8 HBW	ASTM E10
	HBW 10/3000 (95.5 to 650)	2.8 HBW	
Indirect Verification of Microindentation Hardness Testers ³ – Vickers ≥ 1 kgf < 1 kgf Knoop	(200 to 700) HV	6.1 HV	ASTM E92 ASTM E384
	(200 to 700) HV	6.1 HV	
	(200 to 700) HK	13 HK	ASTM E384
Indirect Verification of Rockwell Hardness Testers ³	(80 to 84) HRA	0.64 HRA	ASTM E18
	(70 to 78) HRA	0.54 HRA	
	(20 to 65) HRA	0.54 HRA	
	(80 to 100) HRBW	1.0 HRBW	
	(60 to 79) HRBW	1.1 HRBW	
	(40 to 59) HRBW	1.1 HRBW	
	(60 to 65) HRC	0.62 HRC	
	(35 to 55) HRC	0.73 HRC	
	(20 to 30) HRC	0.93 HRC	
	(93 to 100) HREW	0.71 HREW	
	(84 to 90) HREW	0.71 HREW	
	(70 to 79) HREW	0.77 HREW	
	(94 to 100) HRFW	0.87 HRFW	
(80 to 90) HRFW	0.80 HRFW		
(60 to 75) HRFW	0.83 HRFW		
(90 to 92) HR15N	0.58 HR15N		
(78 to 88) HR15N	0.73 HR15N		
(70 to 77) HR15N	0.60 HR15N		
(87 to 93) HR15TW	0.63 HR15TW		
(81 to 86) HR15TW	0.58 HR15TW		
(74 to 80) HR15TW	0.59 HR15TW		



Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ (cont)	(77 to 82) HR30N (55 to 73) HR30N (42 to 50) HR30N	0.57 HR30N 0.57 HR30N 0.60 HR30N	ASTM E18
	(70 to 83) HR30TW (57 to 69) HR30TW (43 to 56) HR30TW	0.52 HR30TW 0.77 HR30TW 0.48 HR30TW	
EQUOTIP (Leeb) – Indirect Verification, Fixed Point ³	801 Leeb D Hardness	17 Leeb D Hardness	ASTM A956
Scales & Balances ³	0 mg to 220 g 220 g to 32 kg (0.01 to 200 000) lb	34 µg + 0.3 µg/g 0.6R 0.6R	Class 1 weights Class F weights Class F weights
Pressure Gages, Transducers and Transmitters ³	(-14.7 to 300) psi	0.05 % of full scale	Druck DPI-610
	(300 to 5000) psi	0.03 % of full scale	Druck CR2200
	(5000 to 15 000) psi	0.04 % of full scale	Druck DPI104
Force Measure ³ – Transducers (Tension and Compression)	(0 to 100 000) lbf	0.4 % of Indicated Value	ASTM E4 and loadcells
	(0 to 500 000) lbf Compression only	0.05 % of Indicated Value	
Force Gauges ³	(0 to 1000) lbf	0.15 % of Indicated Value + 0.6R	NIST Class F weights
Torque – Calibration of Torque Meters and Sensors	5 in·lbf to 1000 ft·lbf	0.06 % of Applied Load	Torque arms with weights, including specific arms
Torque Wrenches ³	(0 to 250) ft·lbf	0.8 % Indicated Value	CDI torque calibrator using load cells
	(300 to 1000) ft·lbf	1.2 % of Indicated Value	CDI manual torque calibrator



Parameter/Equipment	Range	CMC ² (±)	Comments
Mass, Fixed Points	10 mg	16 µg	Comparison to Class 1 weights
	20 mg	9.9 µg	
	30 mg	16 µg	
	50 mg	13 µg	
	100 mg	23 µg	
	200 mg	11 µg	
	300 mg	9.9 µg	
	500 mg	17 µg	
	1 g	12 µg	
	2 g	14 µg	
	3 g	15 µg	
	5 g	16 µg	
	10 g	22 µg	
	20 g	26 µg	
	30 g	28 µg	
	50 g	32 µg	
	100 g	55 µg	
	200 g	100 µg	
	500 g	670 µg	
	1000 g	1.3 mg	
	2000 g	10 mg	
	5000 g	10 mg	
	10 kg	270 mg	Comparison to Class F weights
	25 kg	340 mg	
	0.001 lb	12 µg	
	0.002 lb	38 µg	
	0.005 lb	16 µg	
	0.01 lb	22 µg	
	0.02 lb	47 µg	
	0.05 lb	34 µg	
	0.1 lb	90 µg	
	0.2 lb	54 µg	
	0.5 lb	190 µg	
	1 lb	6.2 mg	
2 lb	9.1 mg		
5 lb	22 mg		
10 lb	25 mg		
25 lb	280 mg		
30 lb	260 mg		
50 lb	320 mg		
500 lb	6.2 g		
1000 lb	7.6 g		



V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature – Measure	-30 °C to 300 °C	0.10 °C	Omega CL27 with RTD probe
Relative Humidity – Measure ³ Hygrometers and Chart Recorders ³	(10 to 95) % RH	3.2 % RH	Veriteq SP2000-20R
Infrared Temperature – Measuring Equipment ³	35 °C to 100 °C 100 °C to 200 °C 200 °C to 350 °C 350 °C to 500 °C	0.9 °C 1.1 °C 1.6 °C 2.1 °C	Fluke 4181 precision infrared calibrator
Ovens, Furnaces & Freezers ³	-100 °C to 1200 °C	1.4 °C	Omega DAQ56 data acquisition system and thermocouples ASTM E145; uniformity survey only

VI. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Digital / Mechanical Tachometer ³	(40 to 300) rpm (300 to 3000) rpm (3000 to 99 999) rpm	0.013 % RDG ± 1 LSD 0.013 % RDG ± 1 LSD 0.013 % RDG ± 1 LSD	Direct reflective pickup tachometer (LSD=Least significant digit)
Time Interval – Timers and Stopwatches ³	15 s to 24 hr	0.36 s	NIST synchronized computer clock
Frequency – Measuring Equipment ³	0.01 Hz to 2 MHz	290 µHz/Hz	Fluke 5500A



Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measure ³	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 1 MHz	1.2 mHz/Hz 580 µHz/Hz 350 µHz/Hz 0.12 nHz/Hz	Fluke 8846A

¹ This laboratory offers commercial calibration and field 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 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 microinches, D is the numerical value of the nominal diameter of the device measured in inches and Ra is the numerical value of the nominal roughness of the surface measured in micrometers roughness.

⁵ The measurands stated are generated with the Fluke 5500 and 8800 series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand 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

ALL AMERICAN SCALES & CALIBRATION INC.

East Canton, OH

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 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 8 January 2009*).



Presented this 31st day of May 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1848.01
Valid to August 31, 2019

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