



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

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CALIBRATION

Valid To: March 31, 2022

Certificate Number: 1888.05

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional inspections^{1,7}:

I. Chemical

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
pH Measuring Equipment ³	(4.01, 7.0, 10.0) pH units	0.034 pH units	pH buffer solutions
Conductivity ³ – Liquid	(0 to 10) µS (>10 to 100) µS (>100 to 1413) µS (>1413 to 10 000) µS	0.68 µS 0.57 µS 6.0 µS 54 µS	Conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Calipers ³	Up to 80 in	(170 + 12L) μ in	Gage blocks
Micrometers ³	Up to 6 in (6 to 80) in	(20 + 10L) μ in (55 + 13L) μ in	Gage blocks
Height Gages ³	Up to 80 in	(120 + 8L) μ in	Gage blocks
Bore Micrometers and Countersink Gages ³	Up to 4 in	(70 + 20L) μ in	Ring gages
Dial, Digital, Test, Bore & Co-Axial Indicators ³	Up to 4 in	(25 + 6L) μ in	Gage blocks
Rigid Rulers ³	Up to 80 in	0.010 in	Gage blocks
Tape Measures ³	Up to 100 ft	0.014 in per 6 foot	Master rule
Cylindricals – OD Pins, Plugs, Master Disc Outside Diameter ³	Up to 10 in	30 μ in	P&W Supermicrometer TM
Thread Gages ³ – Pitch Diameter Major Diameter	(4 to 80) TPI Up to 10 in	100 μ in 30 μ in	P&W Supermicrometer TM w/Thread Wires P&W Supermicrometer TM
Micrometer Standards ³	Up to 10 in	(33 + 8L) μ in	P&W Supermicrometer TM

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Feeler Gages ³	Up to 1 in	70 μ in	P&W Supermicrometer TM
Surface Plate ³ – Flatness	12 in \times 12 in to 12 ft \times 12 ft	(20 + 2 <i>DL</i>) μ in	Electronic level system <i>DL</i> =diagonal distance
Repeat Reading	12 in \times 12 in to 12 ft \times 12 ft	34 μ in	Repeat-o-meter
Optical Comparator and Vision Machines ³ – X-Y Linearity	Up to 6 in	250 μ in + 0.60 <i>R</i>	Glass master
Crimp Tools ³	Go/No Go Crimp Height	600 μ in 0.001 in	Pin gages Crimp micrometer
Protractors ³	0°, 30°, 45°, 60°, 90°	0.033° + 0.6 <i>R</i>	Angle blocks

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,5,6} (\pm)	Comments
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	21 μ V/V + 1.0 μ V 12 μ V/V + 2.0 μ V 13 μ V/V + 20 μ V 19 μ V/V + 150 μ V 19 μ V/V + 1.5 mV	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
DC Voltage – Measure ³	(0 to 100) mV	10 μV/V + 3.0 μV	Agilent 3458A
	100 mV to 1 V	9 μV/V + 3.0 μV	
	(1 to 10) V	9 μV/V + 5.0 μV	
	(10 to 100) V	11 μV/V + 30 μV	
	(100 to 1000) V	11 μV/V + 100 μV	
	(1 to 9) kV	0.036 %	Vitretek 4700
	(9 to 90) kV	0.67 %	Vitretek 4700 with HVL-4700
	(90 to 175) kV	1.1 %	KVM 200 Divider
DC Current – Generate ³	Up to 330 μA	0.016 % + 0.020 μA	Fluke 5522A
	(330 μA to 3.3 mA)	0.011 % + 0.030 μA	
	(3.3 to 33) mA	0.011 % + 0.20 μA	
	(33 to 330) mA	0.011 % + 2.5 μA	
	330 mA to 1.1 A	0.021 % + 40 μA	
	(1.1 to 3.0) A	0.039 % + 40 μA	
	(3.0 to 11) A	0.051 % + 500 μA	
	(11 to 20.5) A	0.10 % + 750 μA	
Clamp-on only	(20.5 to 1025) A	0.50 % + 0.50 A	Fluke 5520A/coil
DC Current – Measure ³	(10 to 100) μA	22 μA/A + 1.0 nA	Agilent 3458A
	100 μA to 1 mA	22 μA/A + 5.0 nA	
	(1 to 10) mA	22 μA/A + 50 nA	
	(10 to 100) mA	37 μA/A + 0.50 nA	
	100 mA to 1 A	0.012 % + 10 μA	Agilent 34401A Current shunts
	(1 to 3) A	0.13 % + 0.60 mA	
	3 A to 2 kA	0.25 %	
	(2 to 10) kA	1.0 %	

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 kΩ (1.1 to 11) kΩ (11 to 110) kΩ 110 k to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (330 to 1100) MΩ (1 to 10) GΩ (10 to 100) GΩ	40 μΩ/Ω + 1.0 mΩ 30 μΩ/Ω + 1.5 mΩ 28 μΩ/Ω + 1.4 mΩ 28 μΩ/Ω + 2.0 mΩ 28 μΩ/Ω + 20 mΩ 28 μΩ/Ω + 0.20 Ω 32 μΩ/Ω + 2.0 Ω 60 μΩ/Ω + 30 mΩ 0.013 % + 50 Ω 0.025 % + 2.5 kΩ 0.05 % + 3.0 kΩ 0.30 % + 100 kΩ 1.5 % + 500 kΩ 0.51 % 1.1 %	Fluke 5522A Decade box Decade box
Fixed Points ³	1.0 mΩ 10.0 mΩ 100.0 mΩ 1 Ω	50 μΩ/Ω 50 μΩ/Ω 50 μΩ/Ω 50 μΩ/Ω	L&N resistor L&N resistor L&N resistor L&N resistor
Resistance – Measure ³	(0 to 10) Ω (10 to 100) Ω (100 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	20 μΩ/Ω + 50 μΩ 15 μΩ/Ω + 0.50 mΩ 13 μΩ/Ω + 1.1 mΩ 18 μΩ/Ω + 2.0 Ω 50 μΩ/Ω + 100 Ω 0.060 % + 1.0 kΩ 0.50 % + 10 kΩ	Agilent 3458A
Capacitance – Generate ³	(0.19 to 3.3) nF (3.3 to 330) nF 330 nF to 3.3 μF (3.3 to 33) μF (33 to 330) μF 330 μF to 3.3 mF (3.3 to 33) mF (33 to 110) mF	0.50 % + 0.01 nF 0.25 % + 0.30 nF 0.20 % + 3.0 nF 0.40 % + 30 nF 0.45 % + 300 nF 0.45 % + 3.0 μF 0.75 % + 30 μF 0.66 % + 100 μF	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2, 5, 6} (±)	Comments	
Capacitance – Generate Fixed Points ³	(0.001, 0.01, 0.1) μF	0.16 %	GR 1409 series	
	1 μF (0 to 1.1) μF	0.070 %	Quad Tech 1413	
Capacitance – Measure ³ at 1 kHz	(0 to 1120) μF	0.27 %	GR 1689	
Inductance – Generate ³ at 1 kHz	1 mH	0.42 %	GR 1482-E	
	10.0 mH	0.12 %	GR1482-H	
	100 mH	0.12 %	GR1482-L	
Inductance – Measure ³	1 μH to 100 H	0.27 %	GR 1689	
Electrical Calibration of Thermocouple Indicators ³ –	Type B	600 °C to 800 °C	0.49 °C	Fluke 5522A
		800 °C to 1000 °C	0.40 °C	
		1000 °C to 1550 °C	0.36 °C	
		1550 °C to 1800 °C	0.31 °C	
	Type C	0 °C to 150 °C	0.28 °C	
		150 °C to 650 °C	0.23 °C	
		650 °C to 1000 °C	0.28 °C	
		1000 °C to 1800 °C	0.45 °C	
		1800 °C to 2316 °C	0.73 °C	
	Type E	-250 °C to -100 °C	0.05 °C	
		-100 °C to -25 °C	0.15 °C	
		-25 °C to 350 °C	0.13 °C	
		350 °C to 650 °C	0.16 °C	
		650 °C to 1000 °C	0.20 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators ³ – (cont)			
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	0.32 °C 0.15 °C 0.13 °C 0.17 °C 0.22 °C	Fluke 5522A
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	0.30 °C 0.17 °C 0.15 °C 0.23 °C 0.35 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.36 °C 0.20 °C 0.18 °C 0.17 °C 0.25 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.56 °C 0.33 °C 0.31 °C 0.36 °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 0.35 °C 0.33 °C 0.40 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.56 °C 0.22 °C 0.15 °C 0.13 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTDs ³ –			
Pt 385, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 630 °C 630 °C to 800 °C	0.063 °C 0.083 °C 0.10 °C 0.12 °C 0.25 °C	Fluke 5522A
Pt 3926, 100 Ω	-200 °C to 0 °C 0 °C to 300 °C 300 °C to 630 °C	0.06 °C 0.10 °C 0.12 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to 0 °C 0 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.29 °C 0.07 °C 0.08 °C 0.10 °C 0.27 °C	
Pt 385, 200 Ω	-200 °C to 260 °C 260 °C to 630 °C	0.060 °C 0.17 °C	
Pt 385, 500 Ω	-200 °C to 260 °C 260 °C to 400 °C 400 °C to 630 °C	0.060 °C 0.090 °C 0.11 °C	
Pt 385, 1000 Ω	-200 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.050 °C 0.080 °C 0.26 °C	
Ni 120, 120 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.090 °C 0.16 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.35 °C	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	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	0.080 % + 6.0 μ V 0.015 % + 6.0 μ V 0.02 % + 6.0 μ V 0.10 % + 6.0 μ V 0.36 % + 12 μ V 0.80 % + 50 μ V	Fluke 5522A
(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	0.030 % + 8.0 μ V 0.015 % + 8.0 μ V 0.016 % + 8.0 μ V 0.035 % + 8.0 μ V 0.080 % + 32 μ V 0.20 % + 70 μ V	
(0.33 to 3.3) 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	0.030 % + 50 μ V 0.015 % + 60 μ V 0.019 % + 60 μ V 0.030 % + 50 μ V 0.070 % + 130 μ V 0.24 % + 600 μ V	
(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 μ V 0.015 % + 600 μ V 0.024 % + 600 μ V 0.035 % + 600 μ V 0.090 % + 1.6 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 % + 2.0 mV 0.020 % + 6.0 mV 0.025 % + 6.0 mV 0.030 % + 6.0 mV 0.20 % + 6.0 mV	
(330 to 1020) V	45 Hz to 10 kHz	0.030 % + 10 mV	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Voltage – Measure ³			
(1 to 10) mV	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.031 % rdg + 0.030 % rng 0.021 % rdg + 0.010 % rng 0.031 % rdg + 0.010 % rng 0.011 % rdg + 0.010 % rng 0.51 % rdg + 0.010 % rng 4.1 % rdg + 0.020 % rng	Agilent 3458A
(10 to 100) mV, 100 mV to 1 V, (1 to 10) V	(10 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	0.0080 % rdg + 0.0050 % rng 0.0080 % rdg + 0.0020 % rng 0.015 % rdg + 0.0020 % rng 0.031 % rdg + 0.0020 % rng 0.081 % rdg + 0.0020 % rng 0.031 % rdg + 0.010 % rng 2.0 % rdg + 0.010 % rng 2.0 % rdg + 0.010 % rng	
(10 to 100) V	(10 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	0.021 % rdg + 0.0040 % rng 0.021 % rdg + 0.0020 % rng 0.021 % rdg + 0.0020 % rng 0.036 % rdg + 0.0020 % rng 0.13 % rdg + 0.0020 % rng 0.41 % rdg + 0.013 % rng 1.8 % rdg + 0.010 % rng	
(100 to 750) V	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.041 % rdg + 0.0040 % rng 0.041 % rdg + 0.0020 % rng 0.061 % rdg + 0.0020 % rng 0.13 % rdg + 0.0020 % rng 0.31 % rdg + 0.0020 % rng	
750 V to 9 kV	(50 to 60) Hz	0.45 %	Vitrek 4700
(9 to 70) kV	(50 to 60) Hz	1.5 %	Vitrek 4700 with HVL-4700
(70 to 100) kV	60 Hz	1.5 %	KVM 200 divider

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Current – Generate ³			
(29 to 330) µA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.03 % rdg + 6.0 µA 0.15 % rdg + 1.0 µA 0.13 % rdg + 0.1 µA 0.3 % rdg + 0.20 µA 0.8 % rdg + 0.10 µA 1.6 % rdg + 0.50 µA	Fluke 5522A
330 µA to 3.3 mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 30) kHz	0.20 % rdg + 17 µA 0.14 % rdg + 16 µA 0.11 % rdg + 15 µA 0.20 % rdg + 0.30 µA 0.90 % rdg + 0.60 µA	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.20 % rdg + 5.0 µA 0.20 % rdg + 15 µA 0.12 % rdg + 15 µA 0.08 % rdg + 2.0 µA 0.19 % rdg + 3.0 µA 1.0 % rdg + 6.0 µA	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % rdg + 20 µA 0.50 % rdg + 50 µA 0.050 % rdg + 5.0 µA 0.10 % rdg + 50 µA 0.15 % rdg + 75 µA 0.40 % rdg + 500 µA	
330 mA to 1.1 A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.19 % rdg + 300 µA 0.050 % rdg + 200 µA 0.10 % rdg + 500 µA 3.0 % rdg + 2.0 mA	
(1.1 to 3) A	(10 to 45) Hz (0.45 to 1) kHz (1 to 10) kHz	0.18 % rdg + 100 µA 0.80 % rdg + 600 µA 0.80 % rdg + 1.0 mA	
(3 to 11) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	1.8 % rdg + 5.0 mA 2.5 % rdg + 5.0 mA 3.0 % rdg + 5.0 mA	
(11 to 20.5) A	(45 to 100) Hz (0.1 to 5) kHz	1.0 % rdg + 500 mA 2.5 % rdg + 500 mA	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Current – Generate ³ (cont) Clamp-on Only (20.5 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.80 % 0.99 %	Fluke 5522A w/Fluke 50-turn coil
AC Current – Measure ³ (5 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	0.45 % rdg + 0.030 % rng 0.18 % rdg + 0.030 % rng 0.80 % rdg + 0.030 % rng	Agilent 3458A
(1, 10, 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	0.41 % rdg + 0.020 % rng 0.16 % rdg + 0.020 % rng 0.07 % rdg + 0.020 % rng 0.04 % rdg + 0.020 % rng 0.40 % rdg + 0.040 % rng 0.42 % rdg + 0.040 % rng 0.56 % rdg + 0.16 % rng	
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	0.42 % rdg + 0.020 % rng 0.16 % rdg + 0.020 % rng 0.10 % rdg + 0.020 % rng 0.12 % rdg + 0.020 % rng 0.35 % rdg + 0.020 % rng 0.35 % rdg + 0.020 % rng	
3 A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz	1.2 % rdg + 0.060 % rng 0.37 % rdg + 0.060 % rng 0.17 % rdg + 0.060 % rng	HP 34401A
3 A to 1 kA	45 Hz to 5 kHz	0.80 %	Clamp-on meter

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Oscilloscopes ³ –			
DC			
50 Ω	(0 to +/- 6.6) V	0.26 % + 40 μV	Fluke 5522A/SC1100
1 M Ω	(0 to +/- 130) V	0.06 % + 40 μV	
Square Wave			
50 Ω	(0 to +/- 6.6) V	0.26 % + 40 μV	
1 M Ω	10 Hz to 10 kHz (0 to +/- 130) V 10 Hz to 10 kHz	0.2 % + 40 μV	
Level Sine Wave			
Amplitude (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 300 μV 2.5 % + 300 μV 5.0 % + 300 μV 6.0 % + 300 μV	
Flatness (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 100 μV 3.0 % + 100 μV 5.0 % + 100 μV 6.0 % + 100 μV	
Time Marker	1 ns to 20 ms 50 ms to 5 s	3 μs/s (30 + 1000 <i>t</i>) μs/s	<i>t</i> = time in seconds

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Universal Testing Machines, Compression Testing Machines and Tension Testing Machines ³	(0.2 to 600) lbf	0.04 % + 0.6 <i>R</i>	Deadweights, ASTM E4
	Up to 600 000 lbf	0.4 % + 0.6 <i>R</i>	Load cells; the range for testing machines in tension is only to 60 000 lbf.ASTM E4

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Calibration of Force Gages, Load Cells, Dynamometers & Cable Tensiometers ³	Up to 200 lbf	0.02 % + 0.6R	Comparison to Class F weights, compression & tension
	(0 to 500) lbf	0.32 lbf + 0.6R	Master load cells – tension & compression
	(0 to 1 000) lbf	0.94 lbf + 0.6R	
	(0 to 10 000) lbf	4.0 lbf + 0.6R	
Pressure Gages and Transducers –			
Hydraulic ³	(10 to 15 000) psig	0.12 % + 0.6R	Ametek T150 deadweight tester
Pneumatic ³	Up to 1500 psig	0.05 psig + 0.015 % + 0.6R	Fluke PPC3+
Pneumatic ³	Up to 100 psia	0.0025 psia + 0.025 %	Fluke PPC2+
Vacuum	Up to 28 inHg	0.001 inHg + 0.012 %	DH Instruments PPC2+; gage pressure only, not absolute.
Torque ³ –			
Wrenches	20 in·oz to 600 ft·lbf	1.0 %	Master dead weight standards, master length standard, CDI Datatest 950-DT
Analyzers	(10 to 24 000) in·lbf	0.1 %	Class F weights and various torque wheels and arms
Guns, Drivers, Screwdrivers	(0.2 to 250) Nm	0.40 %	Crane torque transducers

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
RPM ³ – Measure	(6 to 8300) RPM (8300 to 24 999) RPM	0.02 % + 0.1 RPM 0.02 % + 1.0 RPM	Laser tachometer
Calibration of Scales and Balances ³	(1 to 20) mg (20 to 500) mg 500 mg to 5 g (5 to 20) g 20g to 20 kg 0.25 oz to 1 lb (1 to 10) lb (10 to 1200) lb	30 μ g + 0.6R 30 μ g + 0.6R 50 μ g + 0.6R 0.001 % + 0.6R 0.0005 % + 0.6R 0.05 % + 0.6R 0.002 % + 0.6R 0.012 % + 0.6R	Comparison to Class 1 weights Comparison to Class F weights

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Temperature Measuring Equipment ³ – Liquid in Glass Thermometers, Dial, RTDs, and Thermocouples	-30 °C to 200 °C 200 °C to 400 °C	0.056 °C + 0.6R 0.14 °C + 0.6R	Master PRT display with probe, temperature bath Block calibrations with Master PRT display with probe
Temperature – Measure ³	-80 °C to 420 °C	0.056 °C	Master PRT display with probe
Relative Humidity – Measure ³	(10 to 90) % RH (90 to 95) % RH	1.2 % RH 2.3 % RH	Vaisala HMP series

Parameter/Equipment	Range	CMC ^{2,4,6} (±)	Comments
Relative Humidity – Measuring Equipment	(10 to 95) % RH	1.3 % RH	Fluke 5128A
Ovens, Chambers, Freezers, Furnaces ^{3,9}	(-196 to 400) °C (>400 to 550) °C (550 to 800) °C (800 to 1000) °C (1000 to 1200) °C	0.14 °C 1.6 °C 3.8 °C 4.7 °C 5.6 °C	Fluke 1502 with PRT Fluke 753 with TC
IR Thermometry – Measuring Equipment ³	(50 to 100) °C (100 to 250) °C (250 to 500) °C	0.7 °C 2.7 °C 4.8 °C	Hart 9132 Emissivity \cong 0.95

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Frequency – Measure ³	10 Hz to 500 MHz 500 MHz to 1.3 GHz	0.011 μ Hz/Hz 0.002 μ Hz/Hz	HP 5334B
Frequency – Measuring Equipment ³	(10 to 500) MHz	20 μ Hz/Hz	HP 3325B, Fluke 5522A
Tachometer – Optical ³	(0 to 60 000) RPM	0.001 RPM	Agilent 3325B
Stopwatches and Timers ³	(0.1 to 86 400) s	0.03 s/day	Helmut Timometer

¹ This laboratory offers commercial calibration service, field calibration service.

- ² Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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 length of the unit under test in inches; D is the diagonal of the unit under test in inches; and R is the resolution of the device under test.
- ⁵ In the statement of CMC, the first percentage given is the percentage of the reading, unless otherwise noted.
- ⁶ 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.
- ⁷ This scope meets A2LA's *P112 Flexible Scope Policy*.