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

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CALIBRATION

Valid To: March 31, 2027 Certificate Number: 1277.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's - R025 Calibration Program Requirements), accreditation is granted to this laboratory at the location listed above as well as the satellite laboratory location listed below to perform the following calibrations[1, 9]:

I. Acoustical Quantities

Parameter/Range	Frequency	CMC[2] (±)	Comments
Microphone Acoustic Level –			
Sensitivity: ¼, ½, & 1 in	114 dB @ 250 Hz	0.29 dB	Modal shop acoustic calibration system
Frequency Response: ¼, ½, & 1 in	20 Hz to 92.2 kHz	0.30 dB + 0.000 84 dB/kHz	
Sound Level Calibrators –			
(74 to 124) dB	(0.25 to 1) kHz	0.29 dB	Modal shop acoustic calibration system
Sound Level Meters –			
(94 and114) dB	(0.125 to 2) kHz	0.65 dB	Acoustic method
	(0.02 to 20) kHz	0.12 dB	Electrical method

II. Chemical

Parameter/Equipment	Range	CMC[2, 6, 10] (±)	Comments
pH[3] – Measuring Equipment	4.01 pH unit 7.01 pH unit 10.01 pH unit	0.019 pH unit 0.023 pH unit 0.025 pH unit	Accredited solutions
Conductance[3] – Measuring Equipment	1.015 mS/cm 1.408 mS/cm 12.85 mS/cm 111.3 mS/cm	0.0072 mS/cm + 0.6*R* 0.0096 mS/cm + 0.6*R* 0.080 mS/cm + 0.6*R* 0.63 mS/cm + 0.6*R*	Accredited solutions

III. Dimensional

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Micrometers[3] Flatness Parallelism	Up to 36 in Up to 1 in Up to 0.0001 in	(0.31 + 8.0*L*) µin + 0.6*R* 4.8 µin 6.1 µin	Gage blocks w/ optical Parallels
Tri-Bore	Up to 5 in	(6.4 + 4.4*L*) µin + 0.6*R*	Ring gage set
Calipers[3]	Up to 36 in	(0.56 + 8.0*L*) µin + 0.6*R*	Gage blocks
Angle[3]	90° Up to 180°	0.000 43° 0.000 048 °/°	Master square Sine bar/gage blocks
Rulers & Tape Measures	Up to 1000 ft	0.001 in/ft	Ruler/Tapes calibrator

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Optical Comparators[3]–			
Magnification	10× 20× 31.25× 50× 62.5× 100×	530 µin 420 µin 390 µin 380 µin 380 µin 380 µin	Magnification scale Glass scale
Linear Accuracy	(0.001 to 6) in	120 µin + 0.6*R*	
Angle	(30/60/90/120/150)°	0.0048° + 0.6*R*	
Cylindrical Gages[3] –			
Pins, Plugs, Discs	Up to 4.0 in	(4.6 + 5.4*L*) µin	ULM & gage blocks
Height Gages[3, 8]	Up to 48 in	(48 + 4.5*L*) µin	Gage blocks
Indicators[3] – Dial & Digital	Up to 4 in	(54 + 0.74*L*) µin + 0.6*R*	Gage blocks
Gage Blocks	(0.01 to 4) in (0.5 to 100) mm (>4 to 20) in	(3 + 1.4*L*) µin (120 + 1.8*L*) nm (5 + 3.5*L*) µin	Twin head comparison ULM
Length Standards	Up to 20 in	(5 + 3.5*L*) µin	ULM
Linear Displacement[3]	Up to 60 in Up to 254 M	(930 + 21*L*) µin 0.47 mm	String pot calibration system Measurement Wheel System
Radius Gage	(0.005 to 5) in	0.0012 in	Optical comparator
Threaded Plug Gages –			
Pitch Diameter (5 to 80 TPI)	Up to 8 in	(72 + 1.6*L*) µin	ULM, thread wires, gage blocks
Major Diameter	Up to 8 in	(4.6 + 5.4*L*) µin	ULM & gage blocks

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Thread rings –			
Pitch Diameter (5 to 80 TPI)	Up to 6.5 in	Set Plug Tolerance	Class W thread setting plugs
Gage Balls	Up to 4 in	(4.6 + 5.4*L*) µin	ULM
Ring Gages	Up to 8 in	(4.6 + 5.4*L*) µin	ULM, master rings & gage blocks
Foils & Thickness Gages	Up to 8 in	(4.6 + 5.4*L*) µin	ULM
Geometric Measurements –			
X Axis	Up to 900 mm	3.9 µm + 0.0043 µm/mm	CMM
Y Axis	Up to 1000 mm	4.0 µm + 0.0043 µm/mm	
Z Axis	Up to 600 mm	3.9 µm + 0.0042 µm/mm	
Cylindrical Gages[3] –			
Pins, Plugs, Discs	Up to 3 in 3 to 8 in	0.84 µin/in + 9.5 µin 1.4 µin/in + 6.8 µin	LabMaster, Gr.00 GB & XXX Master Rings
Gage Blocks (Add)	(0.01 to 4) in (>4 to 20) in	(3.5 + 1.7*L*) µin (0.063 + 2.6*L*) µin	LabMaster w/Gr 00 Gage Blocks
Threaded Plug Gages –			
Pitch Diameter (5 to 80) TPI	Up to 8 in	(33 + 0.7*L*) µin	LabMaster w/Gr 00 gage blocks & thread wires
Major Diameter	Up to 8 in	(3.3 + 2.1*L*) µin	LabMaster w/Gr 00 gage blocks
Plain Ring Gages	Up to 3 in	0.44 µin/in + 10 µin	LabMaster, Gr.00 GB & XXX master rings
	(3 to 8) in	1.4 µin/in + 6.8 µin	LabMaster & grade 00 GB & XXX master ring

V. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 11] (±)	Comments
AC Current[3] – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 16 nA 0.020 % + 10 nA 0.014 % + 8 nA 0.033 % + 12 nA 0.13 % + 65 nA	Fluke 5730A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 40 nA 0.020 % + 35 nA 0.013 % + 35 nA 0.027 % + 110 nA 0.13 % + 650 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.038 % + 400 nA 0.020 % + 350 nA 0.013 % + 350 nA 0.028 % + 550 nA 0.14 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz (40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 4 µA 0.021 % + 3.5 µA 0.014 % + 2.5 µA 0.033 % + 3.5 µA 0.14 % + 10 µA	
(0.22 to 2.2) A	(20 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.031 % + 35 µA 0.059 % + 80 µA 0.86 % + 160 µA	
(2.2 to 11) A	(40 to 1000) Hz (1 to 5) kHz (5 to 10) kHz	0.053 % + 170 µA 0.11 % + 380 µA 0.42 % + 750 µA	Fluke 5730A/5725A
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3.1 % + 5 mA	Fluke 552XA

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
AC Current[3] – Generate (cont.)			
(>20.5 to 40) A (>40 to 200) A (>200 to 1025) A	(45 to 440) Hz (45 to 440) Hz (45 to 440) Hz	0.46 % + 0.008 A 0.53 % + 0.01 A 0.35 % + 0.04 A	Fluke 552XA w/ EA002 2/10/50 Coil
AC Current[3] – Measure			
(0 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	5 mA/A + 30 nA 2.1 mA/A + 30 nA 1.1 mA/A + 30 nA 1.1 mA/A + 30 nA	HP 3458A, option II
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz	4.6 mA/A + 0.20 µA 1.7 mA/A + 0.20 µA 0.70 mA/A + 0.20 µA 0.36 mA/A + 0.20 µA 0.70 mA/A + 0.20 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.100 to 5) kHz (5 to 20) kHz	4.9 mA/A + 2 µA 2 mA/A + 2 µA 0.94 mA/A + 2 µA 0.60 mA/A + 2 µA 0.93 mA/A + 2 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.100 to 5) kHz (5 to 20) kHz	4.9 mA/A + 20 µA 2 mA/A + 20 µA 0.94 mA/A + 20 µA 0.60 mA/A + 20 µA 0.69 mA/A + 20 µA	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.5 % + 0.2 mA 0.24 % + 0.2 mA 0.15 % + 0.2 mA 0.18 % + 0.2 mA	
(1 to 10) A	(45 to 1000) Hz (1 to 3) kHz (3 to 5) kHz	0.055 % 0.058 % 0.08 %	HP 3458A w/ Fluke Y5020A current shunt

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
AC Voltage[3] – Generate			
(0 to 2.2) mV	(10 to 20) Hz	0.63 mV/V + 4 µV	Fluke 5730A
	(20 to 40) Hz	0.86 mV/V + 4 µV	
	(40 to 20 000) Hz	0.50 mV/V + 4 µV	
	(20 to 50) kHz	0.59 mV/V + 4 µV	
	(50 to 100) kHz	0.82 mV/V + 5 µV	
	(100 to 300) kHz	1.8 mV/V + 10 µV	
	(300 to 500) kHz	3.4 mV/V + 20 µV	
	(500 to 1000) kHz	5 mV/V + 20 µV	
(2.2 to 22) mV	(10 to 20) Hz	0.26 mV/V + 4.0 µV	
	(20 to 40) Hz	0.14 mV/V + 4.0 µV	
	(40 to 20 000) Hz	0.12 mV/V + 4.0 µV	
	(20 to 50) kHz	0.22 mV/V + 4.0 µV	
	(50 to 100) kHz	0.46 mV/V + 5.0 µV	
	(100 to 300) kHz	1 mV/V + 10 µV	
	(300 to 500) kHz	1.4 mV/V + 20 µV	
	(500 to 1000) kHz	2.9 mV/V + 20 µV	
(22 to 220) mV	(10 to 20) Hz	0.23 mV/V + 12 µV	
	(20 to 40) Hz	64 µV/V + 7.0 µV	
	(40 to 20 000) Hz	55 µV/V + 7.0 µV	
	(20 to 50) kHz	0.12 mV/V + 7.0 µV	
	(50 to 100) kHz	0.31 mV/V + 17 µV	
	(100 to 300) kHz	0.59 mV/V + 20 µV	
	(300 to 500) kHz	1.2 mV/V + 25 µV	
	(500 to 1000) kHz	2.5 mV/V + 45 µV	
(0.22 to 2.2) V	(10 to 20) Hz	0.22 mV/V + 40 µV	
	(20 to 40) Hz	36 µV/V + 15 µV	
	(40 to 20 000) Hz	36 µV/V + 8.0 µV	
	(20 to 50) kHz	59 µV/V + 10 µV	
	(50 to 100) kHz	78 µV/V + 30 µV	
	(100 to 300) kHz	0.30 mV/V + 80 µV	
	(300 to 500) kHz	0.87 mV/V + 200 µV	
	(500 to 1000) kHz	1.5 mV/V + 300 µV	
(2.2 to 22) V	(10 to 20) Hz	0.22 mV/V + 400 µV	
	(20 to 40) Hz	37 µV/V + 150 µV	
	(40 to 20 000) Hz	37 µV/V + 50 µV	
	(20 to 50) kHz	59 µV/V + 100 µV	
	(50 to 100) kHz	73 µV/V + 200 µV	
	(100 to 300) kHz	0.23 mV/V + 600 µV	
	(300 to 500) kHz	0.86 mV/V + 2.0 mV	
	(500 to 1000) kHz	1.5 mV/V + 3.2 mV	

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
AC Voltage[3] – Generate (cont)			
(22 to 220) V*	(10 to 20) Hz (20 to 40) Hz (40 to 20 000) Hz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.23 mV/V + 4.0 mV 59 µV/V + 1.5 mV 50 µV/V + 0.6 mV 73 µV/V + 1.0 mV 0.14 mV/V + 2.5 mV 0.86 mV/V + 16 mV 4.2 mV/V + 40 mV 7.8 mV/V + 80 mV	Fluke 57X0A *220V range subject to 2.2E7 V-Hz Limitation
(220 to 1100) V	(40 to 1000) Hz (1 to 20) kHz (20 to 30) kHz	68. µV/V + 3.1 mV 0.12 mV/V + 4.7 mV 0.43 mV/V + 8.5 mV	Fluke 5730A/5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.47 mV/V + 8.5 mV 1.7 mV/V + 35 mV	
AC Voltage[3] – Measure			
(0 to 10) mV	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.023 % + 1.1 µV 0.035 % + 1.1 µV 0.12 % + 1.1 µV 0.58 % + 1.1 µV 4.6 % + 2 µV	HP 3458A, option II
(10 to 100) mV	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz	0.0087 % + 2 µV 0.017 % + 2 µV 0.035 % + 2 µV 0.093 % + 2 µV 0.35 % + 10 µV 1.2 % + 10 µV 1.7 % + 10 µV	
100 mV to 1 V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz (1 to 2) MHz	0.0081 % + 20 µV 0.016 % + 20 µV 0.035 % + 20 µV 0.092 % + 20 µV 0.35 % + 0.1 mV 1.2 % + 0.1 mV 1.7 % + 0.1 mV	
(1 to 10) V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 1000) kHz	0.0081 % + 0.2 mV 0.016 % + 0.2 mV 0.035 % + 0.2 mV 0.092 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV	

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
AC Voltage[3] – Measure (cont)			
(10 to 100) V	(40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.023 % + 2 mV 0.023 % + 2 mV 0.040 % + 2 mV 0.14 % + 2 mV	HP 3458A, option II
(100 to 1000) V	(40 to 1000) Hz	0.51 % + 20 mV	
(1 to 10) kV	(30 to 200) Hz	0.14 % IV + 0.1 V	Vitrek 4700 high voltage meter
(10 to 30) kV	(30 to 200) Hz	0.22 % IV	Vitrek 4700 high voltage meter with HVP-35 probe
Capacitance[3] – Generate			
(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 (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 (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	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 (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (10 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	0.58 % + 0.01 nF 0.52 % + 0.01 nF 0.52 % + 0.01 nF 0.28 % + 0.01 nF 0.26 % + 0.1 nF 0.26 % + 0.1 nF 0.26 % + 0.3 nF 0.26 % + 1 nF 0.26 % + 3 nF 0.26 % + 10 nF 0.41 % + 30 nF 0.46 % + 0.1 µF 0.47 % + 0.3 µF 0.46 % + 1 µF 0.47 % + 3 µF 0.47 % + 10 µF 0.76 % + 30 µF 1.1 % + 0.10 mF	Fluke 552XA
Fixed Points, 1 kHz	100 pF 1 nF to 1 µF	0.058 % 0.016 %	Standard capacitors
Capacitance – Measure			Gen Rad 1615A capacitance bridge
10 pF to 1.1 µF	10 Hz to 100 kHz	0.018 %	CMC is valid at 1 kHz

Parameter/Equipment	Range	CMC[2, 4, 11] (±)	Comments
Oscilloscopes[3] –			
Amplitude, DC Signal			
50 Ω Load	(-6.6 to 6.6) V	0.29 % IV + 40 µV	Fluke 552XA/SC1100
1 MΩ Load	(-130 to 130) V	0.058 % IV + 40 µV	
Amplitude, Square Wave			
50 Ω Load	±1 mV to ±6.6 V_{p-p} 10 Hz to 10 kHz	0.29 % IV + 40 µV	
1 MΩ Load	±1 mV to ±130 V_{p-p} 10 Hz to 1 kHz	0.12 % IV + 40 µV	
Time Marker into 50 Ω Load-Source	5 s to 50 ms	29 parts in 10^6 + 1000 parts in 10^6/s	
	50 ms to 2 ns	2.9 parts in 10^6	
Leveled Sine Wave Relative to 50 kHz	50 kHz to 100 MHz	2.0 % + 100 µV	Fluke 9500B w/ active head(s)
[5 mV to 5.5 V] p-p	(100 to 300) MHz	2.5 % + 100 µV	
[5 mV to 3.5 V] p-p	(300 to 600) MHz	4.7 % + 100 µV	
[5 mV to 3.0 V] p-p	(550 to 1100) MHz	4.3 %	
[5 mV to 3.0 V] p-p	(1.1 to 3.2) GHz	3.4 %	
	(3.2 to 6.0) GHz	3.5 %	
Edge/Rise Time	10 Hz to 2 MHz (125 to 175) ps	20 ps	
	10 Hz to 1 MHz (59 to 81) ps	15 ps	
DC Current[3] – Generate	0.1 nA to 220 µA	41 µA/A + 6.0 nA	Fluke 5730A
	(0.22 to 2.2) mA	31 µA/A + 7.0 nA	
	(2.2 to 22) mA	31 µA/A + 40 nA	
	(22 to 220) mA	44 µA/A + 0.7 µA	
	(0.22 to 2.2) A	96 µA/A + 12 µA	
	(2.2 to 11) A	250 µA/A + 480 µA	Fluke 5730A/5725A
	(1.1 to 3) A	0.039 % + 40 µA	Fluke 552XA
	(3 to 11) A	0.052 % + 0.33 mA	
	(11 to 20) A	0.1 % + 0.75 mA	
	(20 to 40) A	0.45 % + 0.008 A	Fluke 552XA with EA002 2/10/50 Coil
	(40 to 200) A	0.51 % + 0.01 A	
	(200 to 1025) A	0.31 % + 0.04 A	

Parameter/Equipment	Range	CMC[2, 4, 11] (±)	Comments
DC Current[3] – Measure	(10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 10) A (10 to 20) A (20 to 300) A (300 to 1200) A	43 µA/A + 0.8 nA 34 µA/A + 5 nA 35 µA/A + 50 nA 52 µA/A + 0.5 µA 0.15 mA/A + 10 µA 0.13 mA/A + 0.6 mA 0.14 mA/A + 3.3 mA 0.15 mA/A 2.7 mA/A	HP 3458A, option II HP 3458A w/ Fluke Y5020 shunt
DC Voltage[3] – Measure	(0 to 100) mV (0.1 to 1) V (1.0 to 10) V (10 to 100) V (100 to 1000) V (1 to 10) kV (10 to 30) kV	5.2 µV/V + 0.3 µV 4.1 µV/V + 0.3 µV 4.0 µV/V + 0.5 µV 6.2 µV/V + 30 µV 63 µV/V + 0.1 mV* 0.036 % IV + 0.03 V 0.13 % IV	HP 3458A, option II *Add 12 mV/V·$(V_{in}/1000)^2$ for input >100 V Vitrek 4700 high voltage meter Vitrek 4700 high voltage meter with HVP-35 probe
DC Voltage[3] – Generate	(0 to 220) mV (0 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	12 µV/V + 0.39 µV 5.5 µV/V + 0.62 µV 3.5 µV/V + 2.3 µV 4.1 µV/V + 3.9 µV 5.2 µV/V + 39 µV 7.0 µV/V + 0.39 mV	Fluke 5730A

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
Inductance – Measure 100 µH to 5 H	 100 Hz to 100 kHz	 0.12 %	Hewlett Packard 4263B LCR Meter. CMC valid at 1 kHz
Inductance – Generate Fixed Values 100 µH 1 mH 10 mH 100 mH 1 H 5 H	 100 Hz to 10 kHz 100 Hz to 10 kHz 100 Hz to 10 kHz 100 Hz to 10 kHz 100 Hz to 1 kHz 100 Hz to 1 kHz	 0.29 µH 1.2 µH 12 µH 0.12 mH 1.2 mH 6.2 mH	 Gen Rad 1482B Gen Rad 1482E Gen Rad 1482H Gen Rad 1482L Gen Rad 1482P Gen Rad 1482R

Parameter/Equipment	Range	CMC[2, 4, 11] (±)	Comments
Resistance[3] – Measure	(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	15 μΩ/Ω + 0.05 mΩ 13 μΩ/Ω + 0.50 mΩ 10 μΩ/Ω + 5.0 mΩ 10 μΩ/Ω + 50 mΩ 10 μΩ/Ω + 50 mΩ 16 μΩ/Ω + 2.0 Ω 52 μΩ/Ω + 100 Ω 0.051 % + 1.0 kΩ 0.5 % + 10 kΩ	HP 3458A, option II
Resistance[3] – Generate	(1 & 10) mΩ	4.7 μΩ/Ω	L&N reference resistors
	(0.1, 1, 10, 100) Ω (1, 10, 100, 1000) kΩ	4.7 μΩ/Ω 4.7 μΩ/Ω	ESI SR1010 reference resistors
	0 Ω	4.8 μΩ	Copper shorting block
	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (0.33 to 1.099 999) kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (0.33 to 1.099 999) MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	110 μΩ/Ω + .78 mΩ 58 μΩ/Ω + 1.2 mΩ 34 μΩ/Ω + 1.1 mΩ 27 μΩ/Ω + 1.6 mΩ 26 μΩ/Ω + 1.6 mΩ 27 μ Ω/Ω + 16 mΩ 26 μ Ω/Ω + 16 mΩ 27 μ Ω/Ω + 0.16 Ω 26 μ Ω/Ω + 0.16 Ω 30 μΩ/Ω + 1.6 Ω 28 μΩ/Ω + 1.6 Ω 52 μΩ/Ω + 23 Ω 0.11 mΩ/Ω + 39 Ω 0.25 mΩ/Ω + 1.9 kΩ 0.46 mΩ/Ω + 2.3 kΩ 2.4 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 0.39 MΩ	Fluke 5522A
Fixed Values	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	88 μΩ 160 μΩ 180 μΩ 450 μΩ 0.97 mΩ 1.8 mΩ 6.5 mΩ 13 mΩ 65 mΩ 130 mΩ 0.81 Ω 1.9 Ω 14 Ω 46 Ω 390 Ω 940 Ω 10 kΩ	Fluke 5730A

Parameter/Equipment	Range	CMC[2, 11] (±)	Comments
Resistance[3] – Generate (cont)	(0.0001 to 1) TΩ	0.23 % IV. + 0.0011 % IV/GΩ	IET Labs HRRS decade resistor
Electrical Simulation – Thermocouple Indication & Measure devices[3]			
Type C	(0 to 250) °C (250 to 1000) °C (1000 to 1500) °C (1500 to 1800) °C (1800 to 2000) °C (2000 to 2250) °C (2250 to 2315) °C	0.24 °C 0.19 °C 0.21 °C 0.25 °C 0.27 °C 0.34 °C 0.38 °C	Ectron 1140A
Type E	(-270 to -245) °C (-245 to -195) °C (-195 to -155) °C (-155 to -90) °C (-90 to 1000) °C	1.4 °C 0.21 °C 0.12 °C 0.10 °C 0.09 °C	
Type J	(-210 to -180) °C (-180 to -120) °C (-120 to -50) °C (-50 to 1200) °C	0.14 °C 0.12 °C 0.10 °C 0.09 °C	
Type K	(-255 to -195) °C (-195 to -115) °C (-115 to -55) °C (-55 to 1000) °C (1000 to 1372) °C	0.81 °C 0.15 °C 0.11 °C 0.09 °C 0.10 °C	
Type N	(-200 to -140) °C (-140 to -70) °C (-70 to 25) °C (25 to 160) °C (160 to 1300) °C	0.28 °C 0.18 °C 0.14 °C 0.12 °C 0.11 °C	
Type R	(-30 to 45) °C (45 to 160) °C (160 to 380) °C (380 to 775) °C (775 to 1768) °C	0.66 °C 0.49 °C 0.38 °C 0.34 °C 0.30 °C	
Type S	(-30 to 45) °C (45 to 105) °C (105 to 310) °C (310 to 615) °C (615 to 1768) °C	0.67 °C 0.49 °C 0.41 °C 0.37 °C 0.34 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation – Thermocouple Indication & Measure Devices[3] (cont)			
Type T	(-270 to -255) °C (-255 to -240) °C (-240 to -210) °C (-210 to -150) °C (-150 to -40) °C (-40 to 100) °C (100 to 400) °C	2.1 °C 0.57 °C 0.35 °C 0.22 °C 0.14 °C 0.10 °C 0.09 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.31 °C	Fluke 552XA
Electrical Simulation – RTD Indicating Devices[3] –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.058 °C 0.058 °C 0.085 °C 0.1 °C 0.12 °C 0.12 °C 0.27 °C	Fluke 552XA
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.058 °C 0.058 °C 0.081 °C 0.1 °C 0.12 °C 0.14 °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	0.29 °C 0.046 °C 0.058 °C 0.069 °C 0.081 °C 0.092 °C 0.1 °C 0.12 °C 0.27 °C	
Pt 385, 200 Ω	(-200 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	0.046 °C 0.046 °C 0.046 °C 0.058 °C 0.14 °C 0.15 °C 0.16 °C 0.18 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation RTD Indicating Devices[3] – (cont)			
Pt 385, 500 Ω	(-200 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	0.047 °C 0.058 °C 0.058 °C 0.069 °C 0.093 °C 0.093 °C 0.1 °C 0.13 °C	Fluke 552XA
Pt 385, 1000 Ω	(-200 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	0.035 °C 0.035 °C 0.046 °C 0.058 °C 0.069 °C 0.081 °C 0.081 °C 0.27 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.092 °C 0.092 °C 0.16 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	
LF Energy	10 J 50 J 100 J 360 J	0.17 J 0.32 J 0.53 J 2.4 J	Fluke impulse 7000 “Gold Standard”
Phase – Generate[3,] (0 to 180)°	(10 to 65) Hz (65 to 500) Hz (0.5 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.081° 0.20° 0.39° 1.9° 3.9° 7.8°	Fluke 5522A
Phase – Measure[3]	-180° to +360°, Up to 225 MHz	0.025°	HP 53131A

VI. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
RF Absolute Power[3, 5] – Measure			
1 mW Reference	50 MHz	0.79 %	HP 8478B sensor w/ HP 432A power meter & type N connector
(-30 to 10) dBm	100 kHz to 4.2 GHz (4.2 to 18) GHz	1.6 % 1.8 %	Power meter w/: 8482A power sensor 8481A power sensor
(10 to 20) dBm	100 kHz to 4.2 GHz (4.2 to 18) GHz	3.3 % 3.8 %	8482A power sensor 8481A power sensor
(-30 to 20) dBm	10 MHz to 18 GHz	3.8 %	Agilent 5532B, N1913A
RF Absolute Power[3, 5] – Generate			
Sine Wave into 50 Ω			
(-48 to 24) dBm	0.001 Hz to 100 kHz	0.035 dB	Fluke 96040B RF reference source
(-48 to 24) dBm	100 kHz to 128 MHz	0.066 dB	
(-48 to 20) dBm	(128 to 300) MHz	0.088 dB	
(-48 to 20) dBm	(0.3 to 1.4) GHz	0.24 dB	
(-48 to 14) dBm	(1.4 to 3) GHz	0.36 dB	
(-17 to 14) dBm	(3 to 4) GHz	0.37 dB	
(-74 to -17) dBm	(3 to 4) GHz	0.61 dB	
(-74 to -48) dBm	(0.1 to 10) MHz	0.24 dB	
(-84 to -48) dBm	(10 to 128) MHz	0.12 dB	
(-74 to -48) dBm	(128 to 300) MHz	0.12 dB	
(-74 to -48) dBm	(0.3 to 1.4) GHz	0.47 dB	
(-74 to -48) dBm	(1.4 to 3) GHz	0.59 dB	
(-94 to -74) dBm	(0.1 to 10) MHz	0.59 dB	
(-94 to -74) dBm	(1.4 to 3) GHz	1.2 dB	
(-84 to -74) dBm	(128 to 300) MHz	0.35 dB	
(-84 to -74) dBm	(0.3 to 1.4) GHz	0.60 dB	
(-84 to -74) dBm	(3 to 4) GHz	1.2 dB	
(-94 to -84) dBm	(10 to 128) MHz	0.36 dB	
(-94 to -84) dBm	(128 to 300) MHz	0.58 dB	
(-94 to -84) dBm	(0.3 to 1.4) GHz	1.2 dB	
(-130 to -94) dBm	(10 to 128) MHz	0.84 dB	
(-130 to -94) dBm	(128 to 300) MHz	1.8 dB	
(-130 to -94) dBm	(0.3 to 3) GHz	1.8 dB	

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
RF Tuned Power – Measure [3]			
(-129 to 16) dB	(0.0001 to 18) GHz	0.073 dB + 0.007 dB/dB	N5531S System MMR
Amplitude Modulation – Generate [3]			
AM Flatness Carrier Frequency:	Rate Frequency:		
(11 to 13.5) MHz Depth: (0 to 99) %	50 Hz to 50 kHz 20 Hz to 100 kHz	0.16 % 0.32 %	HP 11715A AM/FM test source
Amplitude Modulation – Measure [3]			
(5 to 99%) Depth	100 kHz to 10 MHz	0.89 % of Depth	Agilent E4440A
(5 to 20%) Depth (20 to 99%) Depth	10 MHz to 3 GHz	3.0 % of Depth 0.59 % of Depth	
(5 to 20%) Depth (20 to 99%) Depth	3 to 26.5 GHz	5.3 % of Depth 1.8 % of Depth	
Frequency Modulation – Measure [3]			
Modulation rate: 20 Hz to 10 kHz Deviation: 200 Hz to 40 kHz	250 kHz to 10 MHz	1.8 %	Agilent E4440A
Modulation rate: 20 Hz to 10 kHz Deviation: 200 Hz to 40 kHz	10 MHz to 6.6 GHz	1.8 %	
Distortion – Measure [3]	20 Hz to 20 kHz >20 kHz to 100 kHz	1.2 dB 2.3 dB	HP 8903B audio analyzer
	>100 kHz to 18 GHz	0.23 dB + 0.12 dB/GHz	HP E4440A spectrum analyzer

Parameter/Range	Frequency	CMC[2, 4, 11] (±)	Comments
Frequency Modulation – Generate [3]			
FM Flatness Carrier Frequency:	Rate Frequency:		
(11 to 13.5) MHz	DC to 100 kHz (100 to 200) kHz	0.33 % 0.43 %	HP 11715A AM/FM test source
(88 to 108) MHz	DC to 100 kHz (100 to 200) kHz	0.34 % 0.43 %	
(352 to 432) MHz	DC to 100 kHz (100 to 200) kHz	0.34 % 0.43 %	
Phase Modulation – Measure [3]			
(0.3 to 0.7) rad (0.7 to 100) rad	100 kHz to 6.6 GHz	3.6 % 1.2 %	Agilent E4440A
RF Volts – Measure [3] Fixed Points			
3 V	10 Hz to 10 MHz (10 to 30) MHz (30 to 50) MHz (50 to 70) MHz (70 to 80) MHz (80 to 100) MHz	0.091 % 0.11 % 0.19 % 0.30 % 0.32 % 0.38 %	HP 11049A thermal voltage converter
LISN –			
Insertion Loss (-10 to 0) dB	100 kHz to 400 MHz	0.12 dB	Keysight E5061B/ Hewlett Packard 85032B
Impedance – Magnitude (Up to 150) Ω ± 20 %	100 kHz to 500 kHz 500 kHz to 400 MHz	0.4 Ω 1.2 Ω	CISPR 16-1-2, CISPR 25, ISO 7637, ANSI C63.4
Impedance – Phase (Up to 180) ° ± 12°	100 kHz to 400 MHz	2.5°	
Decoupling Isolation (-70 to 0) dB	100 kHz to 400 MHz	1.0 dB	

VII. Mechanical

Parameter/Equipment	Range	CMC[2, 4, 10] (±)	Comments
Torque Wrench[3]	(4.0 to 40) ozf·in *	1.3 % of IV from (10 to 100) % FS	JETCO TED-40
	(2.5 to 25) lbf·in *	0.32 % of IV from (10 to 100) % FS	Larson STWCS
	(5 to 50) lbf·in *	0.30 % of IV from (10 to 100) % FS	CDI Transducer System
	(40 to 400) lbf·in *	0.29 % of IV from (10 to 100) % FS	
	(100 to 1000) lbf·in *	0.29 % of IV from (10 to 100) % FS	
	(300 to 3000) lbf·in *	0.38 % of IV from (10 to 100) % FS	
	(100 to 1000) ozf·in *	0.49 % of IV (10 to 100) % of range	
	(100 to 1000) lbf·ft	0.14 % of IV (10 to 100) % of range	Futek torque system Note: Ranges indicated by * are related to footnote 3
Acceleration/Vibration – Measuring Equipment			
Voltage Sensitivity, Frequency Response (0.02 to 5000) mV/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	Modal shop 9155
Charge Sensitivity, Frequency Response (0.04 to 100) pC/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	
Piezoresistive Sensitivity, Frequency Response (0.000 08 to 100) mV/V/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	
Digital Sensitivity, Frequency Response (1 to 500 000) Counts/g	(5 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz	2.1 % IV 1.4 % IV 1.2 % IV 1.8 % IV 3.0 % IV	

Parameter/Equipment	Range	CMC[2, 4, 6, 10] (±)	Comments
Durometers –			ASTM D2240
Indenter Extension & Shape	Types A, B, C, D, E, O, OO, & DO		Optical comparator
Diameter Radius Angle Extension	Indenter Diameter Tip radius Indenter Angle Indenter extension length	11 µm 11 µm 0.085° 11 µm	
Indenter Display	Up to 100 Duro Units	0.09 Duro + 0.6*R*	Gage blocks & surface plate
Spring Calibration Force	All scales	0.0013 N	Dual pan balance & weights
Torque[3] – Measuring Equipment			
Torque Transducers	Up to 42 lbf·ft (42 to 300) lbf·ft (1.7 to 600) lbf·ft	0.015 % IV 0.013 % IV 0.015 % IV	Torque arm/dead weight
Pressure Gauges[3] – Measuring Equipment			
Pneumatic	(-5 to 5) psig (-14.5 to 50) psig (-14.5 to 300) psig (-14.5 to 1000) psig	0.0065 % IV + 0.0005 psig 0.0055 % IV + 0.0033 psig 0.0085 % IV + 0.015 psig 0.011 % IV + 0.051 psig	Pace 6000
Hydraulic	(10 to 50) psig (51 to 10 000) psig	0.0088 psig 0.019 %	Deadweight tester
	(-1 to 1) inH_2O	0.0016 inH_2O	Additel ADT 155-05-DP1
	(-10 to 10) inH_2O	0.012 inH_2O	Additel ADT 155-05-DP10
Absolute Pressure[3] – Measuring Equipment & Measure	(9 to 20) psia (0.5 to 80) psia (0.5 to 330) psia (0.5 to 1030) psia	0.0058 % IV + 0.0013 psia 0.0058 % IV + 0.004 psia 0.0063 % IV + 0.017 psia 0.0064 % IV + 0.052 psia	Pace 6000
Scales & Balances[3] –	Up to 629 lb	0.01 % + 0.6*R*	ASTM class 6 weights
Analytical Balances[3]	(1 to 500) mg (0.5 to 10) g (10 to 100) g (100 to 1000) g (1 to 10) kg	0.012 mg + 0.000 088 mg/g 0.0094 mg + 0.0051 mg/g 0.034 mg + 0.0027 mg/g 0.02 mg + 0.0029 mg/g 0.014 mg + 0.0029 mg/g	ASTM class 1 weights

Parameter/Equipment	Range	CMC[2, 4, 6, 10] (±)	Comments
Mass Measure–	(1 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 200) g (200 to 500) g (500 to 1000) g (1 to 2) kg (2 to 5) kg (5 to 10) kg (10 to 20) kg	0.09 mg 0.10 mg 0.13 mg 0.16 mg 6.9 mg 7 mg 7.4 mg 0.02 g 0.03 g 0.16 g 0.16 g	XE-50 XE-50 XE-50 XE-50 PE 1600 PE 1600 PE 1600 TCL-6002 TCL-6002 Setra12000L GP-30K
Fixed Points	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg 50 lb	0.09 mg 0.09 mg 0.09 mg 0.10 mg 0.13 mg 0.16 mg 6.9 mg 6.9 mg 7 mg 7.4 mg 0.02 g 0.03 g 0.16 g 0.16 g 0.000 37 lb (170 mg)	Mass Comparator, Class 1 weight, Substitution method
Force[3, 7] – Measuring Equipment	Up to 500 lbf (100 to 1000) lbf (200 to 2000) lbf (500 to 5000) lbf (1000 to 10 000) lbf (2500 to 25 000) lbf (5000 to 50 000) lbf (10 000 to 100 000) lbf (50 000 to 500 000) lbf	0.01 % IV + 0.6*R* 0.061 % FS 0.050 % FS 0.049 % FS 0.049 % FS 0.056 % FS 0.049 % FS 0.064 % FS 0.059 % FS	ASTM class 6 weights Load cells ASTM E74 Compression only
Gas Flow – Measure	(10 to 100) sccm (100 to 1000) sccm (3 to 100) slm	0.30 % 0.27 % 0.0021 slm/slm + 0.084 slm	Molbox2 System

Parameter/Equipment	Range	CMC[2, 4, 10] (±)	Comments
Rockwell Hardness[3] – Indirect Verification of Superficial Hardness Testers	HRA: Low Medium High HRBW: Low Medium High HRC: Low Medium High HRRW HR15N: Low Medium High HR30N: Low Medium High HR15TW: Low Medium High HR30TW: Low Medium High	 0.54 HRA 0.43 HRA 0.32 HRA 0.83 HRBW 1.0 HRBW 0.79 HRBW 0.86 HRC 1.0 HRC 0.44 HRC 1.6 HRRW 0.99 HR15N 0.80 HR15N 0.97 HR15N 0.49 HR30N 0.78 HR30N 0.38 HR30N 0.52 HR15TW 0.59 HR15TW 0.48 HR15TW 0.97 HR30TW 0.77 HR30TW 0.57 HR30TW	ASTM E18
Universal Testing Machine, Compression Testing Machines, Tension Testing Machines[3]	(0.5 to 500) lbf (100 to 1000) lbf (200 to 2000) lbf (500 to 5000) lbf (1000 to 10 000) lbf (2500 to 25 000) lbf (5000 to 50 000) lbf (10 000 to 100 000) lbf (50 000 to 500 000) lbf	0.011 % IV 0.061 % FS 0.050 % FS 0.058 % FS 0.049 % FS 0.056 % FS 0.056 % FS 0.056 % FS 0.056 % FS	ASTM E4, load cells & dead weights tension & compression Compression only

VIII. Thermodynamics

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Temperature[3] – Measuring Equipment	(-95 to 150) °C (50 to 660) °C	0.014 °C + 42 µ °C/°C 0.031 °C + 72 µ °C/°C	Fluke 1502 w/ 5628 PRT in Bath/Drywell
Infrared Temperature[3] – Measuring Equipment	(-15 to 120) °C (50 to 500) °C	0.29 °C + 0.0013 °C/°C 0.38 °C + 0.0017 °C/°C	Fluke 4180 Thermoworks IR-500
Temperature[3] – Measure	(-95 to 660) °C (200 to 1200) °C	0.031 °C + 72 µ °C/°C 0.4 °C + 5.2 m °C/°C	Fluke 1502 w/ 5628 PRT Type N thermocouple
Thermocouples – Types B, C, E, J, K N, R, S, T, U	(-50 to 660) °C	0.23 °C + 0.12 m °C/°C	Fluke 552XA/ Fluke 1502A/5628
RTDs –	(-95 to 0) °C (0 to 420) °C (420 to 660) °C	0.017 °C 0.035 °C 0.046 °C	HP3458A/Hart 1502A/ 5628
Relative Humidity – Measuring Equipment	(10 to 95) % RH	0.7 % RH	Thunder Scientific 2500
Relative Humidity[3] – Measure	(10 to 90) % RH (90 to 95) % RH	1.4 % RH 2.1 % RH	Vaisala MI70/HMP77B

IX. Time & Frequency

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Frequency – Measuring Equipment	10 MHz	5.7×10^{-12} Hz/Hz	NOVAS WR 2410 GPS receiver
Frequency – Measure[3]	0.01 Hz to 18 GHz	1.6×10^{-9} Hz/Hz	NOVAS WR 2410 GPS receiver w/ Frequency Counter

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Rise Time – Measure [3]	(0.35 to 1000) ns	0.40 ns	Oscilloscope
Stopwatches[3]	(0 to 19.99) s/day	0.039 s/day	NIST RP 960-12, Timometer

[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. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the Calibration and Measurement Capability Uncertainty (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 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, the value is defined as the percentage of reading unless otherwise indicated; IV represents *Indicated Value* and FS represents *Full Scale*.

[5] The CMCs do not include mismatches.

[6] In the statement of CMC, L represents the length of the unit under test in inches or millimeters, where appropriate; R represents the resolution of the unit under test.

[7] Greater than 100 klbf, field service available only.

[8] Repeatability of the Unit Under Test has not been utilized in the calculation of the CMC value for this measurement parameter.

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

[10] 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.

[11] 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. CMCs 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

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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 2nd day of April 2025.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1277.01
Valid to March 31, 2027
Revised May 8, 2026

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