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

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CALIBRATION

Valid To: December 31, 2023 Certificate Number: 1318.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 12]:

I. Acoustics & Vibration

Parameter/Range	Frequency	CMC[2, 13] (±)	Comments
Sound Level – Measuring Equipment[3]			
94 dB	250 Hz 1 kHz	0.4 dB 0.4 dB	Sound level generator
114 dB	250 Hz 1 kHz	0.4 dB 0.4 dB	
Sound Level – Measure[3]			
(35 to 130) dB	(63 to 8000) Hz	1.8 dB	Sound level meter

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II. Chemical

Parameter/Equipment	Range	CMC[2, 13] (±)	Comments
pH[3] –			
Individual Values	(4, 7, 10) pH units	0.03 pH units	Direct method
Transfer	(4 to 10) pH units	0.03 pH units	Transfer method
Electrical Substitution	(0 to 15) pH units	0.001 pH units	Simulation
Conductivity[3] –			
Solution (Fixed Points)	10 µS 100 µS 1000 µS 10 000 µS	0.65 µS 0.90 µS 3.9 µS 29 µS	Direct method
Transfer	(1 to 10) µS (10 to 100) µS (101 to 1000) µS (1001 to 10 000) µS (10 001 to 100 000) µS	0.66 µS 0.95 µS 5.8 µS 44 µS 300 µS	Transfer method
Resistance Substitution	(10 to 100) µS (101 to 1000) µS (1001 to 10 000) µS (10 001 to 100 000) µS (100 001 to 1 000 000) µS	0.08 µS 0.09 µS 0.08 µS 0.06 µS 0.04 µS	Simulation

III. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Length Measurement[3] – Gage Blocks, Length Standards			
Standard Size Gages	(0.005 to 0.035) in (0.04 to 0.5) in (0.55 to 1.0) in 2 in 3 in 4 in 5 in 6 in 7 in 8 in 10 in 12 in 16 in 20 in	2.5 µin 2.3 µin 2.7 µin 3.7 µin 4.8 µin 5.9 µin 7.6 µin 8.9 µin 10 µin 11 µin 13 µin 14 µin 18 µin 21 µin	Mechanical comparison
Non-Standard Size Gages	(0.001 to 0.005) in (0.005 to 1.0) in (1.1 to 6.0) in (>6.1 to 20.0) in (>20.1 to 40.0) in	4.8 µin (3.0 + 0.78*L*) µin (5.1 + 0.74*L*) µin (11 + 0.45*L*) µin (20 + 0.38*L*) µin	
Feeler Gages & Shims	Up to 1.0 in Up to 25.4 mm	15 µin 0.38 µm	Gage blocks; universal measuring machines
Height Masters	Up to 24 in Up to 600 mm	24 µin 0.61 µm	Surface plate, gage blocks, indicator & gage amplifier
Height Gages	Up to 60 in Up to 1500 mm	(3 + 3.5*L* + 0.6*R*) µin (0.08 + 0.0035*L* + 0.6*R*) µm	Gage blocks, surface plate

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Length Measuring Equipment[3] – Universal Measuring Machines & Bench Micrometers			
Standard Length	(>0.005 to 1.0) in 2 in 3 in 4 in 5 in 6 in 7 in 8 in 10 in 12 in 16 in 20 in	(2.5 + 0.5L + 0.6R) µin (4.2 + 0.6R) µin (4.9 + 0.6R) µin (6.4 + 0.6R) µin (8.1 + 0.6R) µin (8.9 + 0.6R) µin (9.7 + 0.6R) µin (11 + 0.6R) µin (12 + 0.6R) µin (14 + 0.6R) µin (17 + 0.6R) µin (20 + 0.6R) µin	Mechanical comparison
Non-Standard Length	(20 to 40) in	(20 + 0.86L + 0.6R) µin	
Micrometers[3]	Up to 20 in Up to 500 mm	(7 + 4.5L + 0.6R) µin (0.2 + 0.005L + 0.6R) µm	Gage blocks
Calipers[3]	Up to 80 in Up to 2000 mm	(24 + 4.6L + 0.6R) µin (0.6 + 0.005L + 0.6R) µm	Gage blocks
LVDT's & Indicators[3]	Up to 12 in Up to 300 mm	(3 + 3.3L + 0.6R) µin (0.08 + 0.003L + 0.6R) µm	Gage blocks, surface plate
Angle Blocks[3]	0.25° to 90°	(13 + 0.07Θ) arcsec	Mechanical comparison Θ is the numerical value of the nominal angle measured in degrees

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Chamfer Gage[3]	(0.15 to 2) in (3.8 to 50) mm	290 µin 7.5 µm	Reference rings
Coordinate Measuring Machines (CMMs)[3] –			
Linear Displacement Accuracy	Up to 72 in Up to 1800 mm	(8 + 3*L*) µin (0.2 + 0.003*L*) µm	Gage blocks, optical flats
Volumetric Repeatability	-----	100 µin 2.5 µm	Ball bar
Probe Repeatability	-----	25 µin 0.6 µm	Reference sphere
Cylindrical Square[3] –			
Squareness	Up to 24 in Up to 600 mm	25 µin 0.6 µin	Mechanical comparison
Levels[3] –			
Electronic Levels and Inclination Meters	Up to 1000 arcsec	0.23 arcsec	Mechanical comparison
Spirit Levels and Clinometers	Up to 48 in Up to 1200 mm	(50 + 0.6*R*) µin/ft (1.3 + 0.6*R*) µm/m	
Optical Flats and Optical Parallels[3]	Up to 4 in Up to 100 mm	6.4 µin 0.16 µm	Reference flat & mechanical comparison
Optical Comparators & Microscopes[3] –			
Measuring Stage Travel	Up to 12 in Up to 300 mm	110 µin 2.8 µm	Glass scales
Squareness	----	110 µin 2.8 µm	
Magnification	5x to 100x	0.024 x Mag %	Reticule or gage balls

Parameter/Equipment	Range	CMC[2, 4, 9] (±)	Comments
Diameter Measurement[3] –			
Pins & Plugs	(0.003 to 40) in (0.076 to 1000) mm	(8.0 + 0.8*D*) µin (0.2 + 0.0007*D*) µm	Mechanical comparison
CMM Spheres & Gage Balls	(0.015 to 4.0) in (0.38 to 100) mm	12 µin 0.3 µm	
Thread Wires	(0.003 to 0.825) in (0.076 to 30) mm	10 µin 0.25 µm	
Thread Plugs			
Pitch Diameter	(4 to 80) TPI	(75 + 2*D*) µin (2 + 0.002*D*) µm	UMM w/thread wires
Major Diameter	Up to 20 in Up to 500 mm	(8.0 + 0.8*D*) µin (0.2 + 0.0007*D*) µm	Universal measuring machine
Rings & Bores	(0.02 to 33) in (0.5 to 838) mm	(5 + 0.9*D*) µin (0.1 + 0.0009*D*) µm	Universal measuring machine
Thread Rings			
Pitch Diameter	Up to 20 in Up to 500 mm	(66 + 0.26*D*) µin (1.7 + 0.0066*D*) µm	Universal measuring machine w/thread balls
Minor Diameter	Up to 20 in Up to 500 mm	45 µin 1.0 µm	UMM
Parallels[3]	Up to 12 in Up to 300 mm	40 µin 1.0 µm	Parallels[3]
Straight Edges[3]	Up to 60 in Up to 1500 mm	40 µin/ft 1.0 µm/m	Mechanical comparison
Planekators[3]	Up to 48 in Up to 1200 mm	57 µin 1.5 µm	Laser system
Profilometers & Surface Testers[3] –	Ra 120 µin Ra 3 µm	8.4 µin 0.2 µm	Roughness standards
Indirect Verification of Ra Measurement	Ra (10 to 200) µin Ra (0.25 to 5) µm	2.6 µin + 7.0 % 0.07 µm + 7.0 %	

Parameter/Equipment	Range	CMC[2, 4, 9] (±)	Comments
Diameter – Measuring Equipment[3]			
Comparators and Similar Equipment			
Standard Length	(>0.005 to 1.0) in 2 in 3 in 4 in 5 in 6 in 7 in 8 in 10 in 12 in 16 in 20 in	3.0 µin 4.0 µin 5.0 µin 6.5 µin 8.0 µin 9.0 µin 10 µin 11 µin 12 µin 14 µin 17 µin 20 µin	Mechanical comparison
Non-Standard Length	(21 to 72) in Up to 1800 mm	(20 + 1.0L + 0.6R) µin (0.5 + 0.025L + 0.6R) µm	Mechanical comparison
Tri-Point Bore Equipment	Up to 10 in Up to 250 mm	(5 + 1.8L + 0.6R) µin (0.1 + 0.5L + 0.6R) µm	Reference rings
Coating Thickness Meters [3]	(2.09 to 20.24) mils	5.8 %	Coating thickness standards
Surface Plate[3] –			
Flatness	6 in x 6 in 118 in x 275 in	12$\sqrt{}$(D/8) µin (4$\sqrt{D}$) µin	Laser system
Repeat Reading	Up to 0.005 in	40 µin	Repeat-o-meter
Protractors[3] –			
Bevel and Digital	(0 to 180)°	220 arcsec	Mechanical comparison

Parameter/Equipment	Range	CMC[2, 4, 9] (±)	Comments
Radius Gage[3]	Up to 2 in	430 µin	Optical comparison
Roughness Standards & Patches[3] –			
ISO Type C	Ra (10 to 200) µin Ra (0.25 to 5) µm	1.5 µin + 7.0 % 0.04 µm + 7.0 %	Reference standard & mechanical comparison
Sine Plates & Bars[3] –			
Parallelism	Up to 15 in Up to 380 mm	78 µin 1.2 µm	Mechanical comparison, Θ is the numerical value of the nominal angle measured in degrees
Angle	Up to 2 in Up to 50 mm	(10 + 0.6Θ) arcsec (10 + 0.6Θ) arcsec	
Thread Pitch Gages[3]	(Up to 6) in	430 µin	Optical comparison
Torque Wheels/Arms[3]	Up to 40 in Up to 1000 mm	(470 + 2L) µin (12 + 0.002L) µm	Mechanical comparison
V Blocks[3] –			
V-Groove Squareness	Up to 4 in Up to (24 × 24 × 24) in Up to (600 × 600 × 600) mm	64 µin 45 µin 1 µm	Mechanical comparison
Adjustable Thread Rings	Up to 2 in Up to 50 mm	(140 + 27D) µin (3.5 + 0.027D) µm	Class (X) master setting plugs

IV. Dimensional Testing/Calibration[1]

Parameter/Equipment	Range	CMC[2, 4, 9, 13] (±)	Comments
Length[8] –			
2D	Up to 30 in Up to 760 mm	200 µin 5.1 µm	CMM
1D	Up to 6 in Up to 12 in Up to 1 in Up to 6 in Up to 1 in	(420 + 0.52*L*) µin 1500 µin 150 µin 150 µin 600 µin	Optical comparison Caliper Micrometer Depth micrometer Gage pins
Squareness[3, 8]	Up to 0.060 in Up to 1.5 mm	20 µin 0.5 µm	Mechanical comparison
Volume[8] –			
X-Axis	Up to 18 in Up to 450 mm	(300 + 43*L*) µin (7.5 + 0.043*L*) µm	CMM - volume calculated based on independent linear measurements
Y-Axis	Up to 20 in Up to 500 mm	(300 + 44*L*) µin (7.5 + 0.045*L*) µm	
Z-Axis	Up to 16 in Up to 400 mm	(300 + 42*L*) µin (7.5 + 0.041*L*) µm	
Surface Finish[8]	Ra (10 to 200) µin	1.5 µin + 7.0 %	Reference standard & mechanical comparison

V. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 7, 9] (±)	Comments
AC Current – Generate[3]			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.079 % + 34 nA 0.04 % + 25 nA 0.016 % + 22 nA 0.07 % + 47 nA 0.19 % + 93 nA	Fluke 5700A
(0 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.081 % + 47 µA 0.041 % + 41 µA 0.017 % + 41 µA 0.067 % + 0.54 µA 0.19 % + 0.94 µA	
(0 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.081 % + 0.47 mA 0.041 % + 0.41 mA 0.017 % + 0.41 mA 0.07 % + 4.7 mA 0.19 % + 9.4 µA	
(0 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.068 % + 39 µA 0.036 % + 17 µA 0.013 % + 13 µA 0.07 % + 47 µA 0.19 % + 94 µA	
(0 to 2.2) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.8 % + 4.1 mA 2.2 % + 47 mA 5.2 % + 93 mA	Fluke 5700A w/ Fluke 5500A/coil
Clamp on Only			
(2.2 to 110) A	(45 to 440) Hz	8.4 % of output	Fluke 5520A w/ Fluke 5500A/coil
(110 to 1025) A	(45 to 440) Hz	14 % mA/A of output	
(0 to 3000) A	10 Hz to 10 kHz	1.0 % of output	Fluke 52120A/3K
(0 to 6000) A	10 Hz to 10 kHz	1.0 % of output	Fluke 52120A/6K

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Current – Measure[3]			
(0 to 200) µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.041 % + 20 nA 0.042 % + 20 nA 0.082 % + 20 nA 0.48 % + 20 nA	Fluke 8508A
(0 to 2) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.031 % + 0.2 µA 0.031 % + 0.2 µA 0.071 % + 0.2 µA 0.47 % + 0.2 µA	
(0 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.04 % + 2 µA 0.04 % + 2 µA 0.08 % + 2 µA 0.48 % + 2 µA	
(0 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.041 % + 20 µA 0.041 % + 20 µA 0.081 % + 20 µA	
(0 to 2) A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.071 % + 0.2 mA 0.083 % + 0.2 mA 0.35 % + 0.2 mA	
(0 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.11 % + 0.2 mA 0.3 % + 0.2 mA	

Parameter/Range	Range	CMC[2, 7] (±)	Comments
AC Power – Generate[3] (45 to 65) Hz			
(3.3 to 8.999) mA	(33 to 330) mV (0.33 to 1020) V	0.25 % 0.21 %	Fluke 5520A
(9 to 32.999) mA	(33 to 330) mV (0.33 to 1020) V	0.18 % 0.12 %	
(33 to 89.99) mA	(33 to 330) mV (0.33 to 1020) V	0.25 % 0.21 %	
(90 to 329.99) mA	(33 to 330) mV (0.33 to 1020) V	0.18 % 0.10 %	
(0.33 to 0.8999) A	(33 to 330) mV (0.33 to 1020) V	0.19 % 0.18 %	
(0.9 to 2.1999) A	(33 to 330) mV (0.33 to 1020) V	0.20 % 0.17 %	
(2.2 to 4.4999) A	(33 to 330) mV (0.33 to 1020) V	0.20 % 0.19 %	
(4.5 to 20.5) A	(33 to 330) mV (0.33 to 1020) V	0.21 % 0.13 %	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Generate[3]			
(0 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.065 % + 6.4 µV 0.028 % + 5.8 µV 0.014 % + 5.9 µV 0.048 % + 13 µV 0.11 % + 21 µV 0.15 % + 39 µV 0.21 % + 77 µV 0.56 % + 77 µV	Fluke 5700A

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Generate[3] (cont)			
(0 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.069 % + 7.3 µV 0.028 % + 7.1 µV 0.014 % + 7.1 µV 0.047 % + 7.1 µV 0.11 % + 9.8 µV 0.15 % + 18 µV 0.21 % + 35 µV 0.55 % + 37 µV	Fluke 5700A
(0 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.069 % + 19 µV 0.028 % + 13 µV 0.013 % + 13 µV 0.047 % + 13 µV 0.11 % + 36 µV 0.13 % + 36 µV 0.21 % + 51 µV 0.41 % + 0.13 mV	
(0 to 2.2) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.068 % + 0.05 mV 0.021 % + 14 µV 0.008 % + 12 µV 0.016 % + 11 µV 0.032 % + 23 µV 0.055 % + 28 µV 0.14 % + 62 µV 0.28 % + 1.2 mV	
(0 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.07 % + 1.2 mV 0.021 % + 0.1 mV 0.01 % + 84 µV 0.016 % + 75 µV 0.032 % + 63 µV 0.07 % + 2 mV 0.17 % + 5.8 mV 0.35 % + 11 mV	
(0 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.07 % + 12 mV 0.021 % + 3.6 mV 0.011 % + 1.5 mV 0.029 % + 4.7 mV 0.07 % + 12 mV 0.19 % + 130 mV	
(0 to 1100) V	50 Hz to 1 kHz	0.0091 % + 21 mV	

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
AC Voltage – Measure[3]			
(0 to 200) mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.021 % + 14 µV 0.017 % + 4 µV 0.014 % + 4 µV 0.013 % + 2 µV 0.016 % + 4 µV 0.040 % + 8 µV 0.090 % + 20 µV	Fluke 8508A
(0.2 to 2) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.019 % + 120 µV 0.014 % + 20 µV 0.011 % + 20 µV 89 µV/V + 20 µV 0.013 % + 20 µV 0.026 % + 40 µV 0.068 % + 200 µV 0.37 % + 2 mV 1.3 % + 20 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.019 % + 1.2 mV 0.014 % + 0 .2 mV 0.011 % + 0.2 mV 90 µV/V + 0.2 mV 0.013 % + 0.2 mV 0.026 % + 0.4 mV 0.068 % + 2 mV 0.37 % + 20 mV 2.2 % + 200 mV	
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.020 % + 12 mV 0.014 % + 2 mV 0.011 % + 2 mV 90 µV/V + 2 mV 0.013 % + 2 mV 0.026 % + 4 mV 0.068 % + 20 mV	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz (0.04 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.019 % + 70 mV 0.015 % + 20 mV 0.014 % + 20 mV 0.027 % + 40 mV 0.071 % + 200 mV	
High Voltage (0 to 28) kV	60 Hz	1.7 V + 0.052 V/V	Agilent 34401A w/ Fluke 80k-40

Parameter/Range	Frequency	CMC[2, 7, 9, 13] (±)	Comments
Capacitance – Generate[3]			
< 3.3 nF	10 Hz to 10 kHz	0.93 %	Fluke 5520A
(3.3 to 11) nF	10 Hz to 1 kHz	0.41 %	
(11 to 33) nF	10 Hz to 1 kHz	0.64 %	
(33 to 110) nF	10 Hz to 1 kHz	0.40 %	
(110 to 330) nF	10 Hz to 1 kHz	0.40 %	
(0.33 to 1.1) µF	(10 to 600) Hz	0.40 %	
(1.1 to 3.3) µF	(10 to 300) Hz	0.40 %	
(3.3 to 11) µF	(10 to 150) Hz	0.41 %	
(11 to 33) µF	(10 to 120) Hz	0.58 %	
(33 to 110) µF	(10 to 80) Hz	0.63 %	
(110 to 330) µF	(10 to 50) Hz	0.63 %	
(0.33 to 1.1) mF	(10 to 20) Hz	0.63 %	
(1.1 to 3.3) mF	(10 to 6) Hz	0.65 %	
(3.3 to 11) mF	(10 to 2) Hz	0.63 %	
(11 to 33) mF	(10 to 0.6) Hz	0.98 %	
(33 to 110) mF	(10 to 0.2) Hz	1.4 %	
Capacitance – Measure[3]			
(1 to 100) nF	1 kHz	0.000 88 nF + 0.0005 nF/nF	Hameg LCR meter
(1 to 1000) µF	1 kHz	0.0042 µF/µF	
(1 to 1000) pF	1 kHz	0.023 pF + 0.000 48 pF/pF	

Parameter/Equipment	Range	CMC[2, 7, 9, 13] (±)	Comments
DC Current – Measure[3]	(0 to 200) µA	3.9 µA/A + 2 nA	Fluke 8508A
	(0 to 2) mA	3.9 µA/A + 20 nA	
	(0 to 20) mA	5.3 µA/A + 0.21 µA	
	(0 to 200) mA	24 µA/A + 5.4 µA	
	(0 to 2) A	0.013 % + 0.23 mA	
	(0 to 20) A	0.043 % + 0.82 µA	
	(0 to 500) A	0.16 A + 0.000 19 A/A	w/ current shunt

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
DC Current – Generate[3]	(0 to 220) µA (0 to 2.2) mA (0 to 22) mA (0 to 220) mA (0 to 2.2) A (0 to 3) A (0 to 11) A (0 to 20.5) A	47 µA/A + 7 nA 41 µA/A + 8.4 nA 41 µA/A + 51 nA 52 µA/A + 0.83 µA 91 µA/A + 20 µA 0.028 % + 0.4 mA 0.042 % + 2.4 mA 0.054 % + 14 mA	Fluke 5700A
	(0 to 1000) A	0.31 % + 64 mA	w/ Fluke 5500A/coil
	(0 to 2500) A	0.7 % of output	Fluke 52120A/3K
	(0 to 5000) A	0.7 % of output	Fluke 52120A/6K
DC Power – Generate[3]			
(0.33 to 329.99) mA (0.33 to 2.9999) A (3 to 20.5) A	(0.33 to 1020) V (0.33 to 1020) V (0.33 to 1020) V	0.05 % 0.04 % 0.09 %	Fluke 5520A
DC Voltage – Generate[3]	(0 to 220) mV (0.2 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1000) V	8.6 µV/V + 0.88 µV 8 µV/V + 1.5 µV 7.7 µV/V + 8.6 µV 8.1 µV/V + 9 µV 9.2 µV/V + 0.12 mV 11 µV/V + 0.88 mV	Fluke 5700A
Fixed Point	10 V	0.31 µV/V	Fluke 732B
DC Voltage – Measure[3]	(0 to 200) mV (0 to 2) V (0 to 20) V (0 to 200) V (0 to 1050) V	5.2 µV/V + 0.3 µV 3.9 µV/V + 0.83 µV 2.3 µV/V + 58 µV 6.4 µV/V + 53 µV 6.4 µV/V + 0.62 mV	Fluke 8508A
High Voltage	(1 to 20) kV (20 to 35) kV (35 to 40) kV	2.0 % 1.0 % 2.0 %	DMM w/ Fluke 80k-40

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators – Generate[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	0.06 °C 0.06 °C 0.08 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	Fluke 5520A
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.05 °C 0.05 °C 0.06 °C 0.14 °C 0.15 °C 0.17 °C 0.19 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.06 °C 0.06 °C 0.07 °C 0.10 °C 0.10 °C 0.11 °C 0.13 °C	
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.09 °C 0.09 °C 0.27 °C	
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	0.06 °C 0.05 °C 0.07 °C 0.09 °C 0.10 °C 0.12 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators – Generate[3] (cont)			
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	0.25 °C 0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.11 °C 0.23 °C	Fluke 5520A
Electrical Calibration of Thermocouple Indicators – Generate and Measure[3]			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.58 °C 0.19 °C 0.17 °C 0.19 °C 0.25 °C	Fluke 5520A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.32 °C 0.19 °C 0.17 °C 0.20 °C 0.27 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.39 °C 0.21 °C 0.19 °C 0.31 °C 0.47 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.50 °C 0.30 °C 0.24 °C 0.26 °C 0.34 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.69 °C 0.44 °C 0.40 °C 0.49 °C	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Electrical Calibration of Thermocouple Indicators – Generate and Measure[3] (cont)			
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.57 °C 0.45 °C 0.44 °C 0.56 °C	Fluke 5520A
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.73 °C 0.28 °C 0.19 °C 0.17 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.32 °C	
Magnetic Flux Density – Generate[3], (Gauss Meters)	(0 to 35) G	(0.26 + 0.6*R*)	Helmholtz coils and DMM

Parameter/Equipment	Frequency	CMC[2, 13] (±)	Comments
Inductance – Measure[3]			
1 µH to 100 H	1 kHz	0.5 %	Hameg LCR meter
Inductance – Generate[3]			
(1 to 999) mH	1 kHz	0.5 %	Inductance substitute, Hameg LCR meter

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Oscilloscopes[3] –			
Vertical Deflection			
1 kHz Square Wave into a 50 Ω Load	1 mV to 6.6 $V_{pk - pk}$	0.90 % + 40 µV	Fluke 5522A/SC1100
1 kHz Square Wave into a 1 MΩ Load	1 mV to 130 $V_{pk - pk}$	0.37 % + 40 µV	
Flatness			
Leveled Sine Wave 5 mV to 5.5 V ref @ 50 kHz Bandwidth	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.6 % + 100 µV 2.8 % + 100 µV 5.0 % + 100 µV 6.2 % + 100 µV	
Rise Time	<300 ps	+20 ps / -117 ps	
Time Interval	1 ns to 100 ms 100 ms to 5 s	3.1 µs/s (32 + 1000*t*) µs/s	*t* = time in seconds
Resistance – Generate[3]	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 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	46 µΩ/Ω + 1.2 mΩ 23 µΩ/Ω + 2.2 mΩ 23 µΩ/Ω + 2.7 mΩ 22 µΩ/Ω + 6 mΩ 22 µΩ/Ω + 13 mΩ 22 µΩ/Ω + 60 mΩ 22 µΩ/Ω + 140 mΩ 22 µΩ/Ω + 0.6 Ω 23 µΩ/Ω + 1.4 Ω 25 µΩ/Ω + 6.5 Ω 26 µΩ/Ω + 15 Ω 46 µΩ/Ω + 120 Ω 0.011 % + 0.58 kΩ 0.02 % + 6.1 kΩ 0.041 % + 23 kΩ 0.23 % + 0.5 MΩ 1.3 % + 6.3 MΩ	Fluke 5520A

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Resistance – Generate[3] (cont)			
Fixed points	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	95 µΩ/Ω 95 µΩ/Ω 28 µΩ/Ω 27 µΩ/Ω 17 µΩ/Ω 17 µΩ/Ω 13 µΩ/Ω 13 µΩ/Ω 12 µΩ/Ω 12 µΩ/Ω 14 µΩ/Ω 14 µΩ/Ω 20 µΩ/Ω 21 µΩ/Ω 40 µΩ/Ω 47 µΩ/Ω 0.011 %	Fluke 5700A
	1 Ω	9.3 µΩ/Ω	Fluke 742A-1
	10 kΩ	7.6 µΩ/Ω	Fluke 742A-10k
	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ	15 µΩ/Ω 15 µΩ/Ω 20 µΩ/Ω 25 µΩ/Ω 31 µΩ/Ω 0.013 % 0.070 % 0.25 % 0.45 %	Resistance standard
Resistance – Measure[3]	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω (0.2 to 2) kΩ (2 to 20) kΩ (20 to 200) kΩ (0.2 to 2) MΩ (2 to 20) MΩ (20 to 200) MΩ (0.2 to 2) GΩ	17 µΩ/Ω + 4.8 µΩ 8.9 µΩ/Ω + 30 µΩ 7.9 µΩ/Ω + 60 µΩ 7.9 µΩ/Ω + 0.67 mΩ 7.7 µΩ/Ω + 10 mΩ 8.0 µΩ/Ω + 55 mΩ 8.7 µΩ/Ω + 1.6 Ω 20 µΩ/Ω + 0.11 kΩ 0.012 % + 10 kΩ 0.15 % + 1.0 MΩ	Fluke 8508A

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Air Velocity – Anemometers, Thermal, Pitot, Vane Style and Similar Equipment	(30 to 250) fpm (250 to 1500) fpm (1500 to 9000) fpm	(2.5 + 0.006*F*) fpm (1.2 + 0.011*F*) fpm (5.3 + 0.0083*F*) fpm	Wind tunnel, ΔP measurement with density correction for standard condition normalization *F* is the numerical value of the air velocity measured in fpm
Leak Rate[3] – Pressure Decay, Leak Orifices, Standards and Plates	(1 to 10) sccm (10 to 1000) sccm	0.25 sccm 0.22 %	Fluke Molblocs
Hydrometers[3]	(0.6 to 0.64) sg (0.64 to 1.67) sg (1.67 to 2.0) sg	0.0025 sg 0.0014 sg 0.0049 sg	ASTM E126
Refractometers	(1.300 to 1.395) nD (0 to 30) % Brix	0.0006 nD 0.032 % Brix	Standard solutions

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Mass & Volumetric Flow[3] –			
Gas – Meters, Controllers, Rotameters and Leak Orifices	(1 to 10) sccm (10 to 1000) sccm (1 to 1000) slm	0.25 sccm 0.22 % 0.22 %	Fluke Molblocs
Liquid – Meters, Controllers, Rotometers and Leak Orifices	(10 to 400) gpm	(0.015 + 0.0057*G*) gpm	By comparison to flow standard in closed loop system, density correction applied
	(0.01 to 10) gpm	(0.0018 + 0.14*G*) gpm	Measured by time and weight; density correction applied *G* is the numerical value of the flow measured in gpm
Kinematic Viscosity[3] – Viscometers	< 10 mm²/s (11 to 100) mm²/s (101 to 1000) mm²/s (1001 to 10 000) mm²/s (10 001 to 100 000) mm²/s	0.25 % 0.32 % 0.37 % 0.44 % 0.51 %	OEM specifications
Viscosity Cups –			Certified reference viscosity standards
Zahn	(5 to 1800) mm²/s (35 to 80) s	2.2 %	ASTM D4212
Shell	(2 to 1300) mm²/s (20 to 80) s	2.2 %	
Ford	(2 to 1400) mm²/s (20 to 120) s	2.2 %	ASTM D1200
Piston Operated Volumetric Apparatus[3, 10] – Pipettes, Syringes, Burettes, Liquid, Handlers, Dispensers	(1 to 2000) µL (2000 to 10 000) µL (10 000 to 100 000) µL	0.094 µL 0.22 µL 2.0 µL	Gravimetric method referenced to mass balances and ASTM Class 1 mass standards

Parameter/Equipment	Range	CMC[2, 13] (±)	Comments
Volume – Measuring Equipment[3]	(0.001 to 4000) mL	2.5 mL	ASTM E542, burettes graduated "to deliver", graduated cylinders, volumetric flasks, specific gravity flasks, measuring and dilution pipettes, and transfer and capacity pipettes

VIII. Mechanical

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Force[3] – Load Cells, Tensile & Compression Testers and Force Gages	(25 to 250) cN (250 to 2000) cN (0.01 to 200) lbf (100 to 10 000) lbf (100 to 50 000) lbf (100 to 100 000) lbf (201 to 50 000) lbf	5.2 cN 52 cN 0.011 % (0.000 32F + 0.31) lbf (0.000 31F + 2.0) lbf (0.000 31F + 3.9) lbf 0.05 %	Gram gauge Primary and secondary force standards F is the numerical value of the nominal value of force measured in pound force Tovey Class AA Force Standards
Gas Monitors and Detectors	CO Carbon Monoxide CO_2 Carbon Dioxide LEL Methane O_2 Oxygen	2 % 2 % 2 % 2 %	Standard SRMs

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Durometers[3] –			
Indenter Extension and Shape			
Extension	Up to 0.2 in	160 µin	ASTM D2240 optical inspection under magnification
Diameter	Diameter of the base of the frustum	170 µin	
	Diameter of the top of the frustum	170 µin	
	Diameter of the base of the cone	170 µin	
Angle			
35° Right Circular Conical Frustum	Cone angle	0.1°	
30° cone	Cone angle	0.1°	
Radius	Tip radius	170 µin	
Indentor Display	Indenter thickness Indenter radius	170 µin 160 µin	
Spring Calibration	(0 to 100) duro units	0.89 duro units	Durometer calibrator
Indirect Verification of Rockwell Hardness Testers[3]	HRBW (80 to 100) HRBW (60 to 79) HRBW (40 to 59) HRBW HRC (60 to 65) HRC (35 to 55) HRC (20 to 30) HRC	 0.48 HRBW 0.77 HRBW 1.1 HRBW 0.37 HRC 0.48 HRC 0.57 HRC	ASTM E18
Mass[3]	1 mg to 5 g (5 to 30) g (30 to 200) g (200 to 500) g (500 to 2000) g (2 to 10) kg (10 to 30) kg (30 to 45) kg	0.021 mg 0.024 mg 0.21 mg 2.1 mg 21 mg 0.21 g 0.24 g 0.45 g	OIML Class E1, ASTM Class 1

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Mass – Fixed Points	1 kg 500 g 200 g 100 g 50 g 20 g 10 g 5g 2g 1g 500 mg 200 mg 100 mg 50 mg 20 mg 10 mg 5 mg 2 mg 1 mg	0.86 mg 0.91 mg 0.13 mg 0.018 mg 0.028 mg 0.019 mg 0.015 mg 0.011 mg 0.0091 mg 0.0086 mg 0.0045 mg 0.0045 mg 0.0045 mg 0.0043 mg 0.0042 mg 0.0042 mg 0.0042 mg 0.0042 mg 0.0042 mg	OIML Class E1 weights
Pressure[3] – Absolute, Gauge, Negative Gauge Mode Transducers, Indicators, Controllers and Gauges	(-104 to -7.5) kPa (-7.5 to -2.9) kPa (-2.9 to -0.75) kPa (-0.75 to 0.75) kPa (0.75 to 2.9) kPa (2.9 to 7.5) kPa (7.5 to 26) kPa (26 to 63) kPa (63 to 700) kPa (700 to 7000) kPa (7000 to 82 737) kPa	0.0077 % + 5.2 Pa 0.0091 % 0.0090 % + 0.035 Pa 0.0075 % + 0.051 Pa 0.0090 % + 0.035 Pa 0.0091 % 0.0077 % + 1.3 Pa 0.009 % + 0.05 Pa 0.008 % + 0.0007 kPa 0.008 % + 0.0003 kPa 50 parts in 10^6	Secondary standards Piston gauge
Pneumatic	(9 to 385) kPa (70 to 3825) kPa (140 to 7650) kPa	0.0012 % + 0.1 Pa 0.002 % + 0.6 Pa 0.002 % + 1.2 Pa	Fluke PG7601
Shore – Durometer Calibrators[3]			
Dimensional	Up to 8 in	480 µin	Optical comparison
Mass	(0 to 4) kg	30 mg	Single substitution

Parameter/Equipment	Range	CMC[2, 9, 13] (±)	Comments
Vacuum[3] – Gauges, Controllers and Transducers	(0.004 to 1) Torr (1 to 1000) Torr	0.98 % 0.25 %	Capacitance transducer
Rotation – Measure[3] Belt Speed, Line Speed, Centrifuges, and Mechanical Tachometers	(6 to 8300) rpm (8300 to 99 999) rpm (6 to 8300) rpm (8300 to 99 999) rpm	1.7 rpm 2.6 rpm 2.4 rpm 3 rpm	Optical measurement method Contact measurement method
Scales & Balances[3] –			
100 % 100 % 100 % 100 % 100 %	(0 to 500) mg (0 to 5) g (0 to 31) g (0 to 110) g (0 to 300) g	0.012 mg 0.04 mg 0.09 mg 0.29 mg 0.58 mg	ASTM 1, Class I
100 % 100 % 100 % 100 % 100 % 100 % 50 %	(0 to 100) g (0 to 200) g (0 to 500) g (0 to 1000) g (0 to 10 000) g (0 to 32 000) g (0 to 64 000) g	0.65 mg 5.8 mg 5.9 mg 6.5 mg 0.12 g 0.29 g 1.2 g	ASTM 2, Class II
100 % 100 % 100 % 100 % 100 % 100 % 100 % 100 % 100 % 75 %	(0 to 5) lb (0 to 10 lb (0 to 20) lb (0 to 50) lb (0 to 100) lb (0 to 200) lb (0 to 500) lb (0 to 1000) lb (0 to 5000) lb (0 to 10 000) lb	0.000 65 lb 0.0013 lb 0.0026 lb 0.0082 lb 0.013 lb 0.016 lb 0.035 lb 0.13 lb 0.31 lb 0.59 lb	NIST Class F, Class III
100 % 100 % 100 % 100 % 100 % 100 % 50 % 25 % 12.5 %	(0 to 5) kg (0 to 10) kg (0 to 25) kg (0 to 50) kg (0 to 150) kg (0 to 250) kg (0 to 500) kg (0 to 2500) kg (0 to 5000) kg	0.65 g 1.3 g 4.1 g 6.5 g 19 g 32 g 41 g 0.15 kg 0.29 kg	NIST Class F, Class IV

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Torque – Measuring Equipment[3], Torque Meters and Transducers	(1 to 1000) lbf·in (1 to 2000) lbf·ft	0.09 % 0.08 %	Mass and torque arms
Torque – Measure[3], Wrenches and Watches	(1 to 1000) lbf·in (1 to 2000) lbf·ft	0.52 % 0.52 %	Mechanical loader and transducers

VIII. Optical Quantities

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Light Meters –	(0 to 40) lux (40 to 400) lux (400 to 4000) lux (4000 to 40 000) lux	3.6 % + 0.2 lux 3.6 % + 2.0 lux 3.6 % + 20 lux 4.5 % + 200 lux	Comparison to standard light meter

IX. Thermodynamics

Parameter/Equipment	Range	CMC[2, 13] (±)	Comments
Dew Point[3] –			
Measuring Equipment	(-25 to 68) °C	0.15 °C	Thunder 2500
Measure	(-15 to 20) °C	0.26 °C	Chilled mirror
Infrared Thermometers[3]	(-15 to 100) °C (101 to 120) °C (121 to 200) °C (201 to 350) °C (351 to 500) °C (501 to 1000) °C	0.78 °C 0.83 °C 1.0 °C 1.7 °C 2.3 °C 4.0 °C	Blackbody source E = 0.95

Parameter/Equipment	Range	CMC[2, 13] (±)	Comments
Relative Humidity[3] –			
Measuring Equipment	(10 to 95) % RH	0.28 % reading + 0.24 % RH	Thunder 2500
Measure	(10 to 95) % RH	1.3 % RH	Chilled mirror
Temperature – Measuring Equipment[3]			
SPRT			
Triple Point of Water	0.010 °C	1 mK	Fixed point
Liquid Nitrogen	-197 °C	4.0 mK	
Hg, In, Sn	-100 °C to 300 °C	5.0 mK	ITS-90 SPRT
An	>300 °C to 420 °C	4.0 mK	by comparison. Fluke
Al	>420 °C to 660 °C	5.5 mK	1595A and SPRT
Temperature – Measure			
PRT, RTD, Thermistor, Thermocouple, Stirred and Dry Baths	(-80 to 660) °C (660 to 1250) °C	10 mK 18 mK	SPRT & indicator T/C & indicator

XI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 13] (±)	Comments
Frequency – Measuring Equipment[3]	10 MHz	0.000 050 µHz/Hz	Fluke 910R GPS frequency standard
	1 µHz to 80 MHz	0.58 µHz/Hz	Agilent 33250A
	250 kHz to 3 GHz	0.58 µHz/Hz	Agilent E4432B
Frequency – Measure[3]	1 Hz to 12.4 GHz	0.000 051 µHz/Hz	Agilent 53132A
Stop Watches & Timers[3]	(0.01 to 320) s	580 µs/s	Timometer 4500

Parameter/Equipment	Range	CMC[2] (±)	Comments
Tachometer – Optical Pickup[3]	(0 to 60 000) rpm	0.36 rpm	Agilent 33250A

[1] This laboratory offers commercial dimensional testing/calibration 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 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 resolution of the device measured in inches, and *D* is the diameter measured in inches. *C* is the numerical value of the nominal value of the temperature measured in degrees Celsius.

[5] Volumetric results have similar uncertainty but are dependent upon the thermal coefficients of the measured liquid.

[6] CMC is to be no less than the acceptable closure error for the procedure.

[7] The measurands stated are generated with the Fluke 5520A, 5700A, 5500A, & 8508A series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. Calibration and Measurement Capability is expressed as either a specific value that covers the full range, as a percentage of the reading, or a combination of the two.

[8] This laboratory meets R205 – *Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.

[9] In the statement of CMC, percent should be read as a percentage of the reading, unless otherwise noted.

[10] The contributions from the "best existing device" are not included in the CMC claim.

[11] The CMC includes worst case unit under test insulation resistance effects.

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

[13] 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.

Accredited Laboratory

A2LA has accredited

TANGENT LABS, LLC

Indianapolis, IN

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 22nd day of March 2022.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1318.01
Valid to December 31, 2023

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