SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

PHOENIX CALIBRATION
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CALIBRATION

Valid To: October 31, 2028 Certificate Number: 3022.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations[1, 7]:

I. Acoustical Quantities

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Sound Level[3] – Measuring Equipment			
74 dB	(0.125 to 4) kHz	0.24 dB	Sound level calibrator
84 dB	(0.125 to 4) kHz	0.22 dB	
94 dB	(0.125 to 4) kHz	0.22 dB	
104 dB	(0.125 to 4) kHz	0.22 dB	
114 dB	(0.125 to 2) kHz	0.2 dB	
	(> 2 to 4) kHz	0.21 dB	
Acoustical Calibrator[3] –			
(74 to 114) dB	(1 kHz)	0.34 dB	Sound level meter

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II. Chemical

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Conductivity[3] – Measuring Equipment			
Fixed Points	(0 to 1) µS/cm 5 µS/cm +/-10 % ≈25 µS/ cm ≈50 µS/ cm ≈100 µS/cm ≈147 µS/ cm ≈1000 µS/ cm ≈1412 µS/ cm ≈10 mS/cm ≈100 mS/cm ≈150 mS/cm ≈200 mS/cm	0.31 µS/cm 0.31 µS/cm 0.9 µS/cm 0.62 µS/cm 0.83 µS/cm 2.3 µS/cm 3.2 µS/cm 2.2 µS/cm 32 µS/cm 290 µS/cm 600 µS/cm 600 µS/cm	Conductivity standard solution
Resistivity Simulation	(1 to 100) pS/cm (0.001 to 1) µS/cm 1 µS/cm to 1 mS/cm	0.58 pS/cm + 6 % 0.15 nS/cm + 0.57 % 0.62 µS/cm + 0.53 %	Decade box
pH[3] – Measuring Equipment			
Fixed points	4.00 pH 7.00 pH 10.00 pH	0.017 pH 0.016 pH 0.023 pH	pH buffer solution
pH (mV simulation)	(1.00 to 14.00) pH	0.000 63 pH	Multifunction calibrator
TDS[3] (Total Dissolved Solid) – Measuring Equipment	≈1 mg/L ≈3 mg/L ≈66 mg/L ≈665 mg/L ≈940 mg/L ≈6650 mg/L ≈66 500 mg/L ≈100 000 mg/L ≈133 000 mg/L	0.2 mg/L 0.2 mg/L 0.54 mg/L 2.3 mg/L 2.4 mg/L 22 mg/L 200 mg/L 400 mg/L 400 mg/L	TDS standard solution

III. Dimensional

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Gage Blocks	(0.050 to 4) in (0.5 to 100) mm	(5.6 + 0.27*L*) µin (0.11 + 0.0033*L*) µm	Gage blocks & gage block comparator
Cylindrical Gages (Plugs & Pins)	(0.005 to 1) in (0.127 to 25.4) mm	(28 + 0.0021*L*) µin (0.72 + 0.002*L*) µm	Laser micrometer & master pin gages
Calipers[3] – Outside, Inside, Step & Depth	Up to 48 in Up to 1200 mm	(350 + 0.76*L*) µin (5.9 + 0.000 13*L*) µm	Gage blocks
Height Gages	Up to 48 in Up to 1200 mm	(610 + 1.2*L*) µin (15 + 0.096*L*) µm	Gage blocks
Depth Gage	Up to 48 in Up to 1200 mm	(350 + 0.76*L*) µin (5.9 + 0.000 13*L*) µm	Gage blocks
Micrometers[3] – Outside, Inside & Depth	Up to 48 in Up to 1200 mm	(33 + 4.6*L*) µin (0.8 + 0.0011*L*) µm	Gage blocks
Bore Gages / Triple Point Micrometers	(0.5 to 2) in (12.7 to 50.4) mm	43 µin 0.52 µm	Ring gages
Length Indicators[3]	Up to 8 in Up to 200 mm	(100 + 1.9*L*) µin (2.6 + 0.000 12*L*) µm	Gage blocks
Thickness Gages			
Dial & Digital, Feeler Gages	Up to 1 in Up to 25.4 mm	0.0002 in 5.2 µm	Gage blocks, micrometer
Ultrasonic Coating & Thickness Gages	Up to 4 in Up to 100 mm	100 µin 1 µm	Step block setting standards, gage blocks

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Precision Levels –			
Bubble Levels	(0 to 15) in	36 µin/ft	Surface plate, 10” sine bar, gage blocks
Electronic Levels	(0 to 180) °	0.0053°	
Protractor	(0 to 360) °	0.0053°	Surface plate, sine bar, angle gage blocks
Surface Plate[3, 5] – Flatness Overall	Up to 161 diagonal in	77 µin + (0.69µin/in · *DL*)	Electronic level system (*DL* = diagonal length in inches)
Rulers & Tapes[3]	(0 to 300) mm (0 to 12) in	2.9 µm 120 µin	NIST SOP 10: gauge blocks, measuring microscope
	(0.05 to 36) in (0 to 1000) mm	(190 + 55*L*) µin (13 + 0.021*L*) µm	
	(3 to 100) ft (1 to 30.5) m	(0.019 + 0.000 15*L*) in (0.6 + 0.000 15*L*) mm	NIST SOP 12: digital ruler calibrator
Laser Distance Meter	Up to 15 m	1.8 mm + 0.011 %	Reflect target, tape metric
Microscope[3] –			
Linearity (X, Y, Z)	(300 x 200 x 200) mm (12 x 8 x 8) in	0.0013 mm 53 µin	CEM DI-006-19 gage blocks, length reticle
Angle	(0 to 360) °	0.058°	Angle gage block
Optical Comparator[3] – Linearity (X, Y)	(300 x 200) mm (12 x 8) in	0.0013 mm 59 µin	Gage blocks, length reticle
Sieves – Opening Size Wire Diameter	(0.020 to 125) mm (0.0008 to 5) in	(3.5 + 0.78*D*) µm (150 + 0.56*D*) µin	ASTM E11: measuring microscope
	(0.020 to 125) mm (0.0008 to 5) in	9 µm 430 µin	Caliper

IV. Dimensional Testing[9]

Parameter/Equipment	Range	CMC[2, 6, 10] (±)	Comments
Luer Conical Fittings –			ISO 594/1 & ISO 594/2: measuring microscope
Diameter & Length	Up to 50 mm	(2.9 + 0.8*L*) µm	
1D Dimensional Measurement –			
Length			
X & Y axis	Up to 11.5 in Up to 290 mm	(130 + 1.4*L*) µin (3.3 + 0.013*L*) µm	Vision measuring machine
	(11.5 to 40) in (290 to 1200) mm	2400 µin 0.059 mm	
	(1 to 15) m (3 to 50) ft	2.8 mm 0.11 in	Digital caliper
	(15 to 30.5) m (50 to 100) ft	3.8 mm 0.15 in	Tape Metric
	Up to 0.75 in Up to 20 mm	100 µin 2.4 µm	Vision measuring machine with laser scale
Z axis	0.75 to 7.75 in 20 to 200 mm	(290 + 0.42*L)* µin (6.2 + 0.53*L*) µm	Measuring microscope
	(7.75 to 40) in (200 to 1000) mm	0.0024 in 0.061 mm	Digital caliper
2D Dimensional Measurement –			
Radius	Up to 11.5 in Up to 290 mm	(130 + 1.4*L*) µin (3.3 + 0.013*L*) µm	Vision measuring machine
Angle	11.5 to 40 in (290 to 1000) mm	0.0024 in 0.059 mm	Digital caliper
Area	(0 to 360)°	0.058°	Vision measuring machine
	Up to 84 000 mm^2	0.0043 mm^2 + 0.000 79 %	Vision measuring machine

V. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Current[3] – Generate	(0 to 220) µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	7.7 nA + 23 µA/A 36 nA + 37 µA/A 190 nA + 34 µA/A 4.1 µA + 53 µA/A 32 µA + 79 µA/A	Multifunction calibrator
	(2.2 to 11) A	53 µA + 860 µA/A	Multifunction calibrator with transconductance amplifier
	(11 to 30) A	2 mA + 1.1 mA/A	Multifunction calibrator
Clamp-On Ammeters[3]	Up to 1500 A	(130 mA + 2.8 mA/A)	Multifunction calibrator with 50-coils
DC Current[3] – Measure	(0 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 30) A	4.5 nA + 7.3 µA/A 42 nA + 7.8 µA/A 200 nA + 12 µA/A 960 nA + 46 µA/A 300 µA + 150 µA/A 720 µA + 420 µA/A 5.4 mA + 500 µA/A	8.5-digit digital multimeter
	(30 to 1000) A	2.5 mA + 5.1 mA/A	8.5-digit digital multimeter with shunt
DC Voltage[3] – Generate	(0 to 0.22) V (0.22 to 2.2) V (2.2 to 22) V (22 to 220) V (220 to 1100) V	1.2 µV + 4.8 µV/V 2.3 µV + 6.3 µV/V 14 µV + 4.5 µV/V 520 µV + 7.5 µV/V 1.2 mV + 6.5 µV/V	Multifunction calibrator
	(1.1 to 10) kV	38 V + 0.35 mV/V	Hipot with HV probe
DC Voltage[3] – Measure	(0 to 0.1) V (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V	1.8 µV + 3.9 µV/V 3.1 µV + 3.5 µV/V 32 µV + 3.8 µV/V 480 µV + 5.7 µV/V 3.3 mV + 5.7 µV/V	Precision multimeter
DC High Voltage[3] – Measure	(Up to 100) kV	2.7 V + 0.2 %	High-accuracy kilovolt meter

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
DC Power[3] – Generate	0.01 mW to 337 W (0.01 to 3060) W (3.06 to 20.91) kW	0.028 % 0.027 % 0.079 %	Fluke 5522A
Clamp-On Meters	(0.02 to 1) MW	0.63 %	Fluke 5522A & Fluke 5500B
Resistance[3] – Generate			
Fixed Points	0.0001 Ω 0.000 165 Ω 0.0002 Ω 0.000 25 Ω 0.005 Ω 0.001 Ω 0.002 Ω	14 µΩ 22 µΩ 5.8 µΩ 42 µΩ 9.6 µΩ 14 µΩ 3.7 µΩ	Current shunts
	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 Kω 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	51 µΩ 110 µΩ 210 µΩ 270 µΩ 550 µΩ 1.2 mΩ 2.4 mΩ 10 mΩ 27 mΩ 100 mΩ 0.20 Ω 1.4 Ω 2.5 Ω 26 Ω 48 Ω 470 Ω 1.1 kΩ 12 kΩ	Multifunction calibrator
Variable Points	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (330 to 1100) Ω (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ	1.2 mΩ + 9.8 µΩ/Ω 1.7 mΩ + 11 µΩ/Ω 1.6 mΩ + 21 µΩ/Ω 2.3 mΩ + 27 µΩ/Ω 2.8 mΩ + 32 µΩ/Ω 23 Ω + 27 µΩ/Ω 28 mΩ + 31 µΩ/Ω 230 mΩ + 27 µΩ/Ω	Multifunction calibrator

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Resistance[3] – Generate			
Variable Points	33 to 110) kΩ (110 to 330) kΩ (330 to 1100) kΩ (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	280 mΩ + 31 μΩ/Ω 2.3 Ω + 31 μΩ/Ω 2.8 Ω + 36 μΩ/Ω 35 Ω + 60 μΩ/Ω 60 Ω + 150 μΩ/Ω 2.9 kΩ + 220 μΩ/Ω 3.5 kΩ + 560 μΩ/Ω 12 kΩ + 3.4 mΩ/Ω 580 kΩ + 17 mΩ/Ω	Multifunction calibrator
	(0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ (1 to 10) GΩ (10 to 100) GΩ (0.1 to 1) TΩ (1 to 10) TΩ	82 Ω + 0.57 % 71 Ω + 0.58 % 120 Ω + 1.4 % 12 kΩ + 1.3 % 410 kΩ + 1.1 % 0.91 MΩ + 1.2 % 0.82 GΩ + 2.3 % 8.2 GΩ + 5.9 %	Resistance box
	(0 to 1) Ω (1 to 10) Ω (10 to 100) Ω (100 to 1000) Ω (1 to 10) kΩ (10 to 100) kΩ (100 to 1000) kΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1000) MΩ (1 to 100) GΩ (100 to 1000) GΩ	14 μΩ + 11 μΩ/Ω 260 μΩ + 6.6 μΩ/Ω 2.2 mΩ + 7.9 μΩ/Ω 4.5 mΩ + 8.1 μΩ/Ω 28 mΩ + 11 μΩ/Ω 1.2 Ω + 6.6 μΩ/Ω 170 Ω + 2.1 μΩ/Ω 150 Ω + 11 μΩ/Ω 0.58 MΩ + 20 μΩ/Ω 5.8 MΩ + 370 μΩ/Ω 0.84 GΩ + 1.9 % 8 GΩ + 2 %	Precision multimeter, resistance box

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Resistance[3] – Measure			
(0 to 10) Ω (10 to 100) Ω (100 to 1000) Ω (1 to 10) kΩ	1 kHz	5.9 mΩ + 740 μΩ/Ω 5.9 mΩ + 1 mΩ/Ω 5.9 mΩ + 1.1 mΩ/Ω 0.48 Ω + 0.92 mΩ/Ω	Precision LCR meter

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Resistance[3] – Generate			
(0 to 10) Ω	1 kHz	29 mΩ + 180 μΩ/Ω	Resistance box
(10 to 100) Ω		29 mΩ + 790 μΩ/Ω	
(100 to 1000) Ω		35 mΩ + 0.1 %	
(1 to 10) kΩ		190 mΩ + 0.11 %	
(10 to 100) kΩ		3.2 Ω + 0.13 %	
(100 to 1000) kΩ		0.15 kΩ + 0.11 %	
(1 to 10) MΩ		19 kΩ + 0.054 %	
Capacitance[3] – Measure			
(0 to 10) pF	1 kHz	0.0025 pF + 2.7 %	Precision LCR meter
(10 to 100) pF		0.059 pF + 3.8 mF/F	
(0.1 to 1) nF		59 pF + 28 μF/F	
(1 to 10) nF		190 pF + 78 μF/F	
(10 to 100) nF		67 pF + 570 μF/F	
(0.10 to 1) μF		700 pF + 990 μF/F	
(1 to 10) μF		8.1 nF + 1.7 mF/F	
(10 to 100) μF		220 nF + 1.7 mF/F	
(100 to 1000) μF		1.2 nF + 1.7 %	
Capacitance – Generate			
(10 to 100) nF	1 kHz	0.098 nF + 0.12 %	Capacitance Box
(100 to 2000) nF		0.24 nF + 0.19 %	
Fixed Points[3]			
100 pF	1 kHz	1.6 pF	Standard capacitors
1 nF		4.6 pF	
10 nF		38 pF	
100 nF		0.38 nF	
1 μF		3.8 nF	
10 μF		34 nF	
100 μF		0.34 μF	
1 mF		1.9 μF	
10 mF		0.16 mF	
1 μF	100 Hz, 120 Hz	2.9 nF	
10 μF		32 nF	
100 μF		320 nF	
1 mF		3.6 μF	
10 mF		110 μF	
100 mF		1.1 mF	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Inductance[3] – Measure			
(1 to 100) µH (0.1 to 100) mH (0.1 to 1) H	(100 & 1) kHz	12 nH + 0.36 % 0.42 µH + 0.12 % 41 µH + 0.091 %	Precision LCR meter
Inductance[3] – Generate			
(1 to 100) µH (0.1 to 100) mH (0.1 to 1) H	1 kHz	25 nH + 2.6 % 3 µH + 2.8 % 12 µH + 2.4 %	Inductor decade box

Parameter/Equipment	Range	CMC[2] (±)	Comments
Capacitance[3] – Generate	(0.19 to 11) nF (11 to 330) nF (0.33 to 11) µF (11 to 110) µF (0.11 to 1.1) mF (1.1 to 11) mF (11 to 110) mF	13 pF + 0.47 % 0.42 nF + 0.19 % 15 nF + 0.18 % 170 nF + 0.39 % 12 µF + 0.12 % 13 µF + 0.42 % 120 µF + 1.2 %	Multifunction calibrator
Electrical Simulation of Thermocouple Temperature Indicators[3] –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.54 °C 0.40 °C 0.38 °C 0.39 °C	Temperature simulator in sourcing mode
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.35 °C 0.30 °C 0.36 °C 0.58 °C 0.97 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.23 °C 0.19 °C 0.16 °C 0.16 °C 0.19 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouple Temperature Indicators[3] – (cont)			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.26 °C 0.19 °C 0.17 °C 0.17 °C 0.19 °C	Temperature simulator in sourcing mode
Type K	(-270 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.31 °C 0.21 °C 0.19 °C 0.30 °C 0.46 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.30 °C 0.20 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.47 °C 0.27 °C 0.23 °C 0.22 °C 0.32 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1750) °C	0.68 °C 0.41 °C 0.39 °C 0.47 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1750) °C	0.54 °C 0.45 °C 0.43 °C 0.54 °C	
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 0.31 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouple Simulators[3] –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.57 °C 0.45 °C 0.39 °C 0.41 °C	Temperature simulation meter in measuring mode
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.37 °C 0.32 °C 0.38 °C 0.60 °C 1.0 °C	
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 0.16 °C 0.19 °C 0.24 °C	
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 0.19 °C	
Type K	(-270 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.39 °C 0.22 °C 0.19 °C 0.31 °C 0.47 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.30 °C 0.20 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.47 °C 0.27 °C 0.23 °C 0.22 °C 0.32 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.69 °C 0.45 °C 0.41 °C 0.49 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouple Simulators[3] – (cont)			
Type S	(-25 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.59 °C 0.45 °C 0.46 °C 0.57 °C	Temperature simulation meter in measuring mode
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.73 °C 0.28 °C 0.22 °C 0.17 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.31 °C	
Electrical Simulation of RTD Temperature Simulators[3] –			
PT100 (385)	(-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	0.022 °C 0.044 °C 0.041 °C 0.043 °C 0.045 °C 0.048 °C 0.052 °C	Temperature simulation meter in measuring mode
PT100 (3926)	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.0045 °C 0.0047 °C 0.022 °C 0.040 °C 0.044 °C 0.048 °C	
PT100 (3916)	(-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	0.0045 °C 0.0053 °C 0.0047 °C 0.039 °C 0.042 °C 0.042 °C 0.044 °C 0.047 °C 0.047 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of RTD Temperature Simulators[3] – (cont)			
PT200 (385)	(-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 630) °C	0.011 °C 0.011 °C 0.040 °C 0.040 °C 0.019 °C 0.022 °C 0.027 °C	Temperature simulation meter in measuring mode
PT500 (385)	(-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 630) °C	0.0083 °C 0.0086 °C 0.0088 °C 0.0095 °C 0.025 °C 0.026 °C 0.027 °C	
PT1000 (385)	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C	0.0043 °C 0.020 °C 0.021 °C 0.020 °C 0.022 °C	
PT1000 (385)	(300 to 400) °C (400 to 630) °C	0.023 °C 0.024 °C	
PtNi (385), 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.025 °C 0.019 °C 0.015 °C	
Cu 427, 10Ω	(-100 to 260) °C	0.084 °C	
YS1400	(15 to 50) °C	0.0099 °C	
25 Ω SPRT3	(-200 to 660) °C	0.019 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of RTD Indicators[3] –			
PT100 (385)	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 630) °C (630 to 800) °C	0.014 °C 0.014 °C 0.022 °C 0.035 °C 0.10 °C	Temperature simulator in source mode
PT100 (3926)	(-200 to 0) °C (0 to 300) °C (300 to 630) °C	0.013 °C 0.034 °C 0.12 °C	
PT100 (3916)	(-200 to -190) °C (-190 to 300) °C (300 to 630) °C	0.032 °C 0.03 °C 0.032 °C	
PT200 (385)	(-200 to 260) °C (260 to 400) °C (400 to 630) °C	0.032 °C 0.10 °C 0.11 °C	
PT500 (385)	(-200 to -80) °C (-80 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.033 °C 0.098 °C 0.097 °C 0.21 °C 0.22 °C	
PT1000 (385)	(-200 to -80) °C (-80 to 260) °C (260 to 630) °C	0.098 °C 0.32 °C 0.37 °C	
PtNi 385, 120Ω (Ni120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.013 °C 0.02 °C 0.058 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.88 °C	
YS1400	(15 to 50) °C	0.0099 °C	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate			
(0 to 20) µA	(0.1 to 1) kHz (1 to 10) kHz	12 nA + 17 µA/A 75 nA + 210 µA/A	Multifunction calibrator
(20 to 220) µA	(0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	13 nA + 92 µA/A 22 nA + 240 µA/A 84 nA + 940 µA/A	
(0.22 to 2.2) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	76 nA + 110 µA/A 180 nA + 160 µA/A 840 nA + 940 µA/A	
(2.2 to 22) mA	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	770 nA + 110 µA/A 1.7 µA + 170 µA/A 8.1 µA + 950 µA/A	
(22 to 220) mA	(0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	7.4 µA + 110 µA/A 17 µA + 170 µA/A 58 µA + 1 mA/A	
(0.22 to 2.2) A	(0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	130 µA + 260 µA/A 280 µA + 410 µA/A 0.97 mA + 7.7 mA/A	
(2.2 to 11) A	(0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	2.7 mA + 930 µA/A 1 mA + 1 mA/A 1.6 mA + 4 mA/A	
(11 to 20) A	(0.040 to 1) kHz	7.5 mA + 1.4 mA/A	Multifunction calibrator with transconductance amplifier
(20 to 30) A	(0.040 to 1) kHz	12 mA + 710 µA/A	Advance Calibrator 4015
AC Current[3] – Measure			
(0 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1to 1.05) A (1.05 to 10) A (10 to 30) A	40 Hz to 1 kHz 40 Hz to 1 kHz 40 Hz to 1 kHz 40 Hz to 1 kHz 40 Hz to 1 kHz (0.04 to 1) kHz (0.04 to 1) kHz	38 nA + 410 µA/A 190 nA + 420 µA/A 1.9 µA + 420 µA/A 21 µA + 410 µA/A 230 µA + 610 µA/A 4 mA + 1 mA/A 12 mA + 1 mA/A	8.5-digit digital multimeter

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate			
(0 to 2.2) mV	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	4.7 µV + 2 µV/V 4.7 µV + 2 µV/V 4.8 µV + 12 µV/V 5.9 µV + 62 µV/V 12 µV + 130 µV/V 24 µV + 120 µV/V 25 µV + 420 µV/V	Multifunction calibrator
(2.2 to 22) mV	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	4.8 µV + 19 µV/V 4.8 µV + 19 µV/V 5.5 µV + 90 µV/V 6.5 µV + 350 µV/V 13 µV + 760 µV/V 26 µV + 820 µV/V 26 µV + 2.2 mV/V	
(22 to 220) mV	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	9 µV + 60 µV/V 9 µV + 60 µV/V 13 µV + 180 µV/V 22 µV + 440 µV/V 30 µV + 910 µV/V 67 µV + 1.3 mV/V 79 µV + 2.8 mV/V	
(0.22 to 0.5) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	25 µV + 29 µV/V 26 µV + 30 µV/V 30 µV + 49 µV/V 44 µV + 67 µV/V 100 µV + 320 µV/V 260 µV + 750 µV/V 360 µV + 1.4 mV/V	
(0.5 to 1) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	26 µV + 40 µV/V 26 µV + 41 µV/V 30 µV + 66 µV/V 44 µV + 92 µV/V 100 µV + 390 µV/V 0.34 mV + 860 µV/V 0.43 mV + 1.6 mV/V	
(1 to 2) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	300 µV + 23 µV/V 300 µV + 23 µV/V 160 µV + 68 µV/V 310 µV + 110 µV/V 280 µV + 480 µV/V 580 µV + 900 µV/V 0.64 mV + 1.7 mV/V	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate (cont)			
(2 to 22) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (500 to 1000) kHz	300 µV + 44 µV/V 300 µV + 44 µV/V 460 µV + 69 µV/V 500 µV + 96 µV/V 1.4 mV + 260 µV/V 6.8 mV + 890 µV/V 7.4 mV + 1.4 mV/V	Multifunction calibrator
(22 to 220) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	3 mV + 48 µV/V 4.1 mV + 49 µV/V 6.8 mV + 67 µV/V 7.3 mV + 140 µV/V	
(220 to 1100) V	(0.05 to 1) kHz	27 mV + 66 µV/V	
(0 to 300) V	(0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	9.8 mV + 160 µV/V 22 mV + 620 µV/V 62 mV + 2.5 mV/V	
(300 to 600) V	(0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	14 mV + 170 µV/V 38 mV + 630 µV/V 84 mV + 2.5 mV/V	Multifunction calibrator with transconductance amplifier
(600 to 1000) V	(0.04 to 20) kHz (20 to 30) kHz	21 mV + 170 µV/V 33 mV + 660 µV/V	
(1.1 to 10) kV	60 Hz	25 V + 60 mV/V	Hipot with HV probe
AC Voltage[3] – Measure			8.5-digit digital multimeter
(0 to 100) mV	10 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz	23 µV + 190 µV/V 24 µV + 280 µV/V 0.12 mV + 390 µV/V	
(0.1 to 1) V	10 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 1) MHz	93 µV + 160 µV/V 130 µV + 350 µV/V 610 µV + 600 µV/V 29 mV + 5.1 mV/V	
(1 to 10) V	(0.01 to 1) kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 200 kHz	0.93 mV + 160 µV/V 1.3 mV + 350 µV/V 6.1 mV + 600 µV/V 0.29 V + 5.1 mV/V	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Measure (cont.)			
10 to 100) V	10 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	9.2 mV + 160 µV/V 13 mV + 460 µV/V 24 mV + 230µV/V	8.5-digit digital multimeter
(100 to 1000) V	10 Hz to 1 kHz (1 to 10) kHz	96 mV + 260 µV/V 75 mV + 510 µV/V	
AC High Voltage[3] – Measure	Up to 70 kV	2.2 V + 1.2 %	High-accuracy kilovolt meter
AC Power[3] – Generate			
(0.1089 to 2.97) mW (0.297 to 10.89) mW (1.089 to 29.7) mW (2.97 to 108.9) mW (10.89 to 297) mW (29.7 to 726) mW 72.6 mW to 1.49 W 149 mW to 6.76 W 1.09 mW to 9.18 W 2.97 mW to 33.6 W 10.9 mW to 91.8 W 29.7 mW to 337 W 109 mW to 918 W 297 mW to 2244 W 72.6 mW to 4.59 kW 1.49 W to 20.91 kW	(45 to 65) Hz PF =1	0.0017 mW + 0.2 % 0.015 mW + 0.084 % 0.017 mW + 0.12 % 0.017 mW + 0.11 % 0.17 mW + 0.11 % 0.17 mW + 0.11 % 0.14 % 0.12 % 0.13 % 0.083 % 0.13 % 0.083 % 0.12 % 0.094 % 0.13 % 0.11 %	Fluke 5522A Fluke 5522A & Fluke 5500 with 50 turns coil
Clamp-On Meters			
0.0209 kW to 1 MW	(45 to 65) Hz PF =1	0.95 %	
Phase[3] – Generate	(10 to 65) Hz (65 to 500) Hz (0.5 to 1.0) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) Hz	0.13° 0.3° 0.58° 2.9° 5.8° 12°	Fluke 5522A

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate, Clamp-On Ammeters (0 to 1500) A	(30 to 60) Hz	130 mA + 2.8 mA/A	Multifunction calibrator with 50-coils

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
AC Current[3] – Measure, Clamp-On Ammeters Toroidal	(0 to 1000) A	0.14 A + 2.9 mA/A	Current clamp
Oscilloscopes[3] – Amplitude – DC 50 Ω 1 MΩ Amplitude – Square Wave 50 Ω 1 MΩ Leveled Sine Wave (Flatness ref. 50 kHz) [5 mV to 5.5 V] Amplitude – Leveled Sine Wave 50 Ω Leveled Sine Wave – Frequency 50 Ω	 (-6.6 to 6.6) V (-130 to 130) V Up to 6.6 Vpp Up to 130 Vpp 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 50 kHz Reference [5 mV to 5.5 V] (0.05 to 600) MHz	 47 µV + 0.31 % 0.3 mV + 0.06 % 46 µV + 0.29 % 61 µV + 0.12 % 120 µV + 2.2 % 120 µV + 2.9 % 120 µV + 4.9 % 400 µV + 2.6 % 330 mHz + 8.2 µHz/Hz	Multifunction calibrator with oscilloscope calibration option

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Oscilloscopes[3] – (cont)			
Time Marker Function			Multifunction calibrator with oscilloscope calibration option
50 Ω	5 s to 50 ms 20 ms to 100 ns (20 to 50) ns 10 ns (2 to 5) ns	0.9 ns + 0.65 % 0.058 ps + 0.000 31 % 0.083 fs + 0.000 31 % 0.58 fs + 0.0003 % 0.065 fs + 0.000 31 %	
Edge – Rise Time			
(1 to 10) MHz	≥ 300 ps	41 ps	
Pulse Width –			
10 mV to 2.5 V	(4 to 500) ns	2.4 ns + 11 %	
Welders[3] –			IEC 60974-14:2018
DC Volt DC Amps AC Volt AC Amps	Up to 500 V Up to 1000 A Up to 500 V Up to 1000A	30 mV + 290 µV/V 0.63 A + 1.8 mA/A 0.29 V + 2.9 mV/V 0.33 A + 2.8 mA/A	DMM, clamp meter, load bank

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Volumetric Flow[3,11] – Gas (Air) – Measuring Equipment			
Standard Conditions (Nominal) at 101.3 kPa & 21 °C	(1 to 100) cm^3/min (100 to 250) cm^3/min	0.054 cm^3/min + 1.2 % 0.098 cm^3/min + 1.2 %	Air flow bubble flowmeter
	(250 to 30 000) cm^3/min	0.15 cm^3/min + 1.2 %	Air flowmeter
	(0.02 to 6) L/min (6 to 30) L/min	2.6 mL/min + 1.2 % 15 mL/min + 1.3 %	Air flow bubble flowmeter
Standard Conditions (Air & Nitrogen)	(0 to 300) L/min	15 mL/min + 2.3 %	Mass flow meter
	(100 to 650) ft^3/min	2.4 ft^3/min + 4.7 %	Anemometer, Caliper

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Volumetric Flow[3] – Liquid – Measuring Equipment			
Volume	Up to 1000 mL/min	8.5 µL/min + 0.03 %	Weight standards with timer
	(1 to 20) L/min	18 mL/min + 0.42 %	
	Up to 1200 L/min	66 mL/min + 0.44 %	
	Up to 26 503 200 L/min	14 mL/min + 2.1 %	Ultrasonic flow meter
	(5 to 1000) L/min	1.1 mL/min + 0.19 %	Coriolis mass flow meter
Mass	Up to 1000 g/min	8.5 mg/min + 0.03 %	
	(1 to 20) kg/min	18 g/min + 0.42 %	
	Up to 1200 kg/min	66 g/min + 0.44 %	
	(5 to 1000) kg/min	1.1 g/min + 0.19 %	
Volumetric Flow[3] – Liquid – Measuring Equipment			
Volume Totalizers	Up to 20 L	18 mL + 0.42 %	Gravimetric method: NIST SOP14
	(20 to 650) L	30 mL + 0.45 %	
	(50 to 50 000) L	23 mL + 0.22 %	Coriolis mass flow meter
	(50 to 50 000) L	5.8 mL + 2.2 %	Ultrasonic flow meter
Mass Totalizers	Up to 20 kg	18 g + 0.42 %	Gravimetric method: NIST SOP14
	(20 to 650) kg	30 g + 0.45 %	
	(50 to 50 000) kg	23 g + 0.22 %	Coriolis mass flow meter

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Piston-Operated Volumetric Apparatus[3] – Pipettes, Burettes, Dispensers, Repeaters & Syringes – Measuring Equipment	(> 0.1 to 10) µL (> 10 to 50) µL (> 50 to 100) µL (> 100 to 1000) µL (> 1000 to 10 000) µL (> 10 to 20) mL (> 20 to 100) ml (> 100 to 200) ml	0.027 µL 0.15 µL 0.63 µL 2.9 µL 11 µL 21 µL 53 µL 64 µL	Gravimetric method: ISO 8655-6:2022 PAUL ROBOT (Pipette Automation & Ultra-precise Lab-assistant)
Piston-Operated Volumetric Apparatus[3] – Pipettes, Burettes, Dispensers, Repeaters & Syringes – Measuring Equipment	(> 10 to 100) µL (> 0.1 to 1) mL (> 1 to 10) mL (> 10 to 100) mL	0.56 µL 1.1 µL 2.7 µL 19 µL	Gravimetric method: NIST SOP 14
Volumetric Ware – (To Contain or To Deliver)	(0.1 to 1) ml (> 1 to 10) ml (> 10 to 100) ml (> 0.1 to 1) L (> 1 to 10) L (> 10 to 100) L (100 to 600) L (100 to 75 000) L	2.1 µL 4.9 µL 12 µL 0.1 mL 0.2 mL + 77 µL/L 2.7 mL + 120 µL/L 7.5 mL + 0.023 % 5.1 mL + 0.038 %	NIST SOP 14 - gravimetric method Euramet guide 21
Specific Gravity[3] (Relative Density & Other Related Conversions) – Hydrometers	(0.60 to 1.00) SG (1.00 to 1.36) SG (1.36 to 1.92) SG	0.000 91 SG 0.0015 SG 0.0015 SG	ASTM E126
Specific Gravity[3] (Relative Density & Other Related Conversions) – Hydrometers	(0.60 to 2.00) SG	0.000 42 SG	Digital scale Cuckow method

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Turbidity[3] –			
Turbidity Meter	0.5 NTU 5.0 NTU 10 NTU 20 NTU 100 NTU 500 NTU 1000 NTU 4000 NTU	0.038 NTU 0.032 NTU 0.21 NTU 0.28 NTU 1.6 NTU 5.4 NTU 17 NTU 55 NTU	Certified reference materials – turbidity
Viscosity[3] –			
Viscosity Meter	(3.9 to 5.4) cP (34.03 to 43.25) cP (64.7 to 84.75) cP (119.4 to 161.1) cP (81.03 to 271.4) cP (251.2 to 776.3) cP (869.4 to 1096) cP (384.2 to 561.2) cP (2386 to 10 420) cP (3433 to 19 000) cP (6527 to 36 070) cP (10 120 to 55 970) cP (13 160 to 73 280) cP (17 860 to 99 140) cP	0.0029 cP + 0.24 % 0.035 cP + 0.55 % 0.067 cP + 0.62 % 0.61 cP + 0.41 % 0.14 cP + 0.68 % 0.61 cP + 0.75 % 0.47 cP + 0.98 % 0.61 cP + 0.33 % 4.9 cP + 0.99 % 8.1 cP + 1.1 % 15 cP + 1.2 % 24 cP 1.2 % 30 cP + 1.2 % 40 cP + 1.8 %	ASTM D341: Standard reference solutions Temperature (20 to 40) °C
Viscosity Cup[3] – ASTM/Ford, Zahn, Shell	(5 to 587) cST at 25 °C	1.4 cST + 0.17 %	Viscosity standard solutions, timer

VII. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Durometer[3] – (Types: A, B, C, D, DO, E, M, O, OO, OOO, OOO-S, R)			ASTM D2240: DP = Duro point
Spring Calibration Force			
(M,OO,OOO,OOO-S)	(0 to 100) DP (Up to 197) gf	0.08 DP 0.075 gf	Standard weights
(C,D,DO)	(0 to 100) DP (Up to 4533) gf	0.08 DP 3.7 gf	
(A,B,E,O)	(0 to 100) DP (Up to 816) gf	0.08 DP 0.61 gf	
Indentor Extension & Shape –			
Diameter	Up to 0.5 in	75µin	Measuring microscope
Radius	Up to 0.5 in	75µin	
Angle	(20 to 45)°	0.058°	
Extension	Up to 0.5 in	75 µin	
Indentor Display	Up to 0.2 in	100 µin + 0.05 µin/in	Gage blocks
Indirect Verification of Rockwell Hardness Testers[3]	HRC: Low Medium High HRBW: Low Medium High HR30N: Low Medium High	 0.95 HRC 0.67 HRC 0.62 HRC 1.3 HRBW 1.2 HRBW 1.2 HRBW 1.3 HR30N 0.91 HR30N 0.73 HR30N	ASTM E18

Parameter/Equipment	Range	CMC[2] (±)	Comments
Balances & Scales[3] –	(0.001 to 5) g (5 to 20) g (20 to 200) g (200 to 1000) g (1000 to 5000) g (5 to 30) kg (30 to 65 kg) (65 to 600) kg (600 to 5000) kg (5000 to 25 000) kg (25 000 to 60 000) kg (0 to 100 000) kg	3.5 µg + 0.33 µg/g 7 µg + 0.36 µg/g 51 µg + 0.13 µg/g 0.16 mg + 0.52 µg/g 5.5 mg + 0.14 µg/g 18 mg + 2.3 µg/g 100 mg + 0.71 µg/g 5.5 g + 2.8 g / 25 kg 54 g + 2.8 g /25 kg 1.1 kg + 33 g / 500 kg 5.8 kg + 7.5 kg/15 000 kg 9 kg + 0.058 g/kg	Standards weights Standard weights & substitution method Electrical simulation for capacities exceeding 60 000 kg, process meter
Speed Indicators Rotational Velocity, Rotational Devices, Centrifuges, Shakers, Stirrers, Tachometers, Etc.[3] – Contact	(5 to 1000) rpm (1000 to 10 000) rpm (10 000 to 100 000) rpm (100 000 to 500 000) rpm	0.29 rpm + 0.000 64 % 0.59 rpm + 0.0026 % 1.2 rpm + 0.0057 % 2 rpm + 0.0058 %	Standard tachometer
Non-Contact (Optical)	(30 to 9000) rpm (9000 to 100 000) rpm (100 000 to 500 000) rpm	0.029 rpm + 0.002 % 0.12 rpm + 0.0024 % 1 rpm + 0.0021 %	Standard stroboscope
Speed – Measure	(Up to 50) in/min (2 to 78 000) in/min	0.07 % 1.6 in/min + 0.68 %	Ruler & stopwatch Contact tachometer with 10 cm wheel

Parameter/Equipment	Range	CMC[2] (±)	Comments
Moisture Analyzers (Lost Weight Method)	(0 to 15) %	0.15 %	Analytical balance & convection furnace
Nuclear Surface Moisture & Density Gauge[3, 8] –			
Density	(1786 to 2600) kg/m^3	(1.2 kg/m^3 + 0.47 %)	ASTM D7759
Moisture	(533.8 to 565.8) kg/m	(1.2 kg/m^3 + 1.1 %)	
Air Velocity[3] – Measuring Equipment	(Up to 20) m/s	0.0082 m/s + 1.7 %	IEC 61400 Annex F Standard anemometer
Air Velocity[3] – Measure	(Up to 40) m/s	0.0082 m/s + 1.7 %	IEC 61400 Annex F Standard anemometer
Torque Analyzers/ Testers[3]	(Up to 250) lbf·in (250 to 18 000) lbf·in	0.58 *R* + 0.13 % 0.58*R* + 0.17 %	ASTM E2624-17: torque arms, torque wheels & standards weights
	Up to 25 lbf·in	0.82*R* + 0.062 %	ASTM D3474
Torque Tools[3]	Up to 44 lbf·in (25 to 250) lbf·in (250 to 12 000) lbf·in (12 000 to 18 000) lbf·in	0.000 58 lbf·in + 0.55 % 0.0058 lbf·in + 0.85 % 0.069 lbf·in + 0.49 % 0.12 lbf·in + 0.72 %	ISO 6789
Force[3] –			
Testing Machines Tension	(4 to 100) lbf (100 to 1000) lbf (1000 to 10 000) lbf (10 000 to 25 000) lbf	0.82*R* + 0.75 % 0.82*R* + 0.17 % 0.82*R* + 0.18 % 0.82*R* + 0.067 %	ASTM E4-with ASTM E74 standard load cells

Parameter/Equipment	Range	CMC[2] (±)	Comments
Force[3] – (cont)			
Compression Testing Machines	(4 to 100) lbf (100 to 1000) lbf (1000 to 2000) lbf (2000 to 10 000) lbf (10 000 to 25 000) lbf (25 000 to 100 000) lbf (100 000 to 500 000) lbf	0.82*R* + 0.75 % 0.82*R* + 0.17 % 0.82*R* + 0.18 % 0.82*R* + 0.18 % 0.82*R* + 0.067 % 0.82*R* + 0.13 % 0.82*R* + 0.51 %	ASTM E4-with ASTM E74 standard load cells
Force Gauges[3] – Compression & Tension	Up to 100 lbf (100 to 55 000) lbf	0.82*R* + 0.01 % 0.82*R* + 0.053 %	Weight standards
Pressure & Vacuum[3] – Measuring Equipment			EURAMET Guide 17
Pneumatic	(-14 to 0) psig (-1 to 1) inH_2O (-10 to 10) inH_2O (10 to 300) mmHg (1 to 300) psig (0 to 1000) psia	0.0037 psig 0.0037 inH_2O 0.0035 inH_2O 0.0057 mmHg + 0.064 % 0.000 42 psig + 0.024 % 0.009 psia + 0.014 %	Vacuum gauge Digital pressure gauge Silicon pressure transducer Dead weight ball gauge
Hydraulic	(14.5 to 530) psig (530 to 10 150) psig (0 to 10 000) psig	0.098 psig + 0.011 % 0.062 psig + 0.022 % 0.13 psig + 0.011 %	Pressure transducer Hydraulic dead weight tester
Pneumatic/ Hydraulic	(10 150 to 36 000) psig	11 psig	
Barometric	(60 to 110) kPa	0.049 kPa	Digital pressure gauge

Parameter/Equipment	Range	CMC[2] (±)	Comments
Mass –			NIST SOPs 4, 5, 7 & 8
ASTM Classes 1, 2, 3, 4, 5, 6 & 7 OIML Classes E2, F1, F2, M1, M2 & M3	(1 to 10) mg (20 to 500) mg (1 to 5) g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg (20 to 25) kg 50 kg 100 kg 500 kg	0.0017 mg 0.003 mg 0.0086 mg 0.0076 mg 0.013 mg 0.02 mg 0.045 mg 0.07 mg 0.17 mg 0.19 mg 3.8 mg 7.7 mg 40 mg 100 mg 110 mg 17g 24 g	Mass standards, mass comparators, microbalances & analytical balances

VIII. Optical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Colorimeters[3] –	(0 to 0.17) mg/L (0.17 to 0.48) mg/L (0.48 to 0.69) mg/L	0.051 mg/L 0.061 mg/L 0.073 mg/L	Ozone (mid-range) color standards.
	(0 to 0.25) mg/L (0.25 to 0.97) mg/L (0.97 to 1.68) mg/L	0.091 mg/L 0.10 mg/L 0.14 mg/L	DPD chlorine LR color standards.
	(0 to 0.25) mg/L (0.25 to 1.60) mg/L (1.60 to 2.86) mg/L	0.091 mg/L 0.14 mg/L 0.30 mg/L	DPD chlorine MR color standards.
	(0 to 2.2) mg/L (2.2 to 4.0) mg/L (4.0 to 7.1) mg/L	0.24 mg/L 0.37 mg/L 0.64 mg/L	DPD chlorine HR color standards

Parameter/Equipment	Range	CMC[2] (±)	Comments
Illuminance – Light Meters Visible Spectrum	(4 to 1900) fc	0.12 fc + 2.5 %	Integrating sphere calibration standard
Polarimeter[3] – Optical Rotation Wavelength (325 to 633) nm	(10.818 to 46.736) °	0.0065 °	Quartz control plate
Refraction Index[3]	(0 to 15) ° Brix (15 to 40) ° Brix (40 to 97.05) ° Brix	0.026 ° Brix 0.027 ° Brix 0.036 ° Brix	Refractive index calibration standards
Transmittance[3]/Absorbance[3] – Spectrophotometers (250 – 2800) nm	90 % T/ ≈0.0362 A 30 % T/≈0.5229 A 10 % T/≈1.000 A	0.0022 A 0.0041 A 0.0046 A	Transmission & absorbance glass filter certified reference materials T = Transmittance in Absorbance units (A)
Wavelength[3] – Spectrophotometers	(240 to 642) nm	0.11 nm	Holmium oxide solution wavelength certified reference material
Aerosol Particle Counter[3] – Counting Efficiency	(0.2 to 1) µm	5.3 %	ISO 21501-4 Comparison against a standard particle counter. Uncertainty counting efficiency derived from the formula stated in 21501-4 Annex E
Particle Size Setting	0.3 µm 0.5 µm 1.0 µm 5.0 µm 10.0 µm	0.018 µm 0.012 µm 0.016 µm 0.075 µm 0.1 µm	Uncertainty of size setting error derived from the formula stated in ISO 21501-4 Annex E

IX. Thermodynamics

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Temperature[3] – Measuring Equipment			
Digital & Mechanical Thermometers & Temperature Probes	(-200 to -40) °C (-40 to 0) °C (0 to 232) °C (232 to 420) °C (420 to 660) °C (660 to 1100) °C	0.028 °C 0.026 °C 0.048 °C 0.070 °C 0.081 °C 0.61 °C + 0.3 %	Digital indicator with PRT, liquid baths, dry blocks Thermocouple type S
Temperature[3] – Measuring Equipment			
Ambient Equipment	(-15 to 10) °C (10 to 50) °C (50 to 65) ° C	0.050 °C 0.052 °C 0.079 °C	Digital indicator with PRT, Temperature generator
Thermocouples	(-80 to -40) °C (-40 to 0) °C (0 to 650) °C (650 to 1200) °C	0.3 °C 0.54 °C 0.38 °C 0.69 °C + 0.23 %	Multimeter with Thermocouple type S
Temperature – Dry Blocks	(-80 to 0) °C (0 to 232) °C (232 to 420) °C (420 to 660) °C (660 to 1200) °C	0.062 °C 0.071 °C 0.19 °C 0.20 °C 0.25 °C + 0.2 %	Digital indicator with PRT Process calibrator with Type S thermocouple
Temperature[3] – Liquid-in-Glass Thermometers	(-80 to 105) °C (95 to 205) °C (195 to 405) °C	0.084 °C 0.11 °C 0.14 °C	Digital indicator with PRT, liquid baths, dry blocks
Temperature[3] – Measure			
Temperature Chambers, Ovens, Freezers	(-200 to 0) °C (0 to 232) °C (232 to 420) °C (420 to 660) °C (660 to 1100) °C	0.055 °C 0.067 °C 0.08 °C 0.18 °C 0.8 °C + 0.25 %	Digital indicator with PRT Digital indicator with type S thermocouple

Parameter/Equipment	Range	CMC[2, 4, 6] (±)	Comments
Infrared Temperature Thermometer[3]	(-15 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 500) °C	0.55 °C 0.35 °C 0.96 °C 2.1 °C	Black body IR calibrators
Relative Humidity[3] – Measuring Equipment	(5 to 30) % RH (30 to 50) % RH (50 to 95) % RH	0.85 % RH 0.91 % RH 1.1 % RH	Hygrometer standard, humidity generator
Relative Humidity[3] – Measuring Equipment – Fixed Points	10% RH 50% RH 80% RH	0.34 % RH 0.53 % RH 1.1 % RH	Humidity standard salt, hygrometer standard at 23 °C
Relative Humidity[3] – Measure & Environmental Testing	(5 to 30) % RH (30 to 50) % RH (50 to 95) % RH	0.85 % RH 0.91 % RH 1.1 % RH	EURAMET GUIDE NO.: 20 & IEC 60068-3
Dew Point[3] – Measuring Equipment At 1 Bar	(-80 to -60) °F (-60 to -30) °F (-30 to -20) °F (-20 to 0) °F (-10 to 60) °C	4.4 °F 4.4 °F 6.6 °F 3 °F 0.83 °C	Dew point transmitter Calculated using temperature & humidity standards.

X. Time & Frequency

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Frequency[3] – Measure	Up to 300 MHz	0.34 µHz/Hz	Frequency counter
Frequency[3] – Measuring Equipment	Up to 600 MHz	3.1 µHz/Hz	Multifunction calibrator with frequency counter

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Time[3] – Measure			
Stopwatch & Timing Device	Up to 86 400 s	27 ms + 0.045 µs/s	Frequency counter, frequency generator
Time Relays, Controllers, Indicators	1 ms to 1800 s	0.82 ms + 0.032 µs/s	NIST SP-960-12

MECHANICAL TESTING

In recognition of the is granted to this laboratory[12] to perform the following test on fume hoods, bio-safety cabinets, HEPA filter, and Clean Room Classification.

Test:	**Test Methods:**
BioSafety Cabinets, Class II, Type A1, A2, B1 & B2	NSF/ANSI 49 Annex 5 except 5.7 (site installation assessment) & 5.8 (electrical leakage & ground circuit resistance & polarity
Laboratory Fume Hood (as installed, as used)	ASHRAE 110
Cleanrooms & Associated Controlled environments – Test Methods	ISO 14644-3 - Air Pressure Difference Test at Annex B.1.2, Installed filter system leakage test at Annex B.7.1.2 Aerosol photometer method, Airflow Test at Annex B.2.3, Temperature Test at Annex B.5.1, Humidity Test at Annex B.6.1
Cleanroom & Associated Controlled Environments-Classification of air cleanliness by particle concentration	ISO 14644-1 at Annex A

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[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 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, percentage indicates percent of reading, unless otherwise noted.

[5] 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.

[6] 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.

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

[8] This accreditation includes those field service representatives located in the Dominican Republic and Costa Rica at Av 61, La Guaria, San José, San Vicente reporting to Phoenix Calibration, Santo Domingo, Dominican Republic.

[9] 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.

[10] In the statement of CMC, *R* is the resolution of the unit under calibration, *L* is the numerical value of the nominal length of the device measured in inches or millimeters, *D* is the numerical value of the nominal diameter of the device measured in inches or millimeters.

[11] The contributions from the repeatability of the device under calibration are not included in the CMC claim.

[12] Accreditation is granted for field testing activities at this location only, and only applies to field technicians that are based out of this location.

Accredited Laboratory

A2LA has accredited

PHOENIX CALIBRATION

Santo Domingo, DOMINICAN REPUBLIC

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 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 21st day of September 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3022.01
Valid to October 31, 2028

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