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

CAL-CERT COMPANY
5777 SE International Way
Milwaukie, OR 97222
Brett Bohannon Phone: 208 860 3981

CALIBRATION

Valid To: November 30, 2028 Certificate Number: 4986.01

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, 8]:

I. Chemical

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
pH – Measuring Instruments	4 pH 7 pH 10 pH	0.05 pH 0.05 pH 0.05 pH	Standard pH solutions
Conductivity Meters[3]	100 µS/cm 10 µS/cm	2.3 µS/cm 0.65 µS/cm	CP-024 conductivity standards

II. Construction Material Laboratory Equipment

Parameter/Equipment	Range	CMC[2] (±)	Comments
CBR Mold & Spacer[3] –			
Dimensions	Up to 8 in	650 µin	ASTM D1883
Volume	Up to 184 in³	0.13 in³	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Conical Mold & Tamper[3] –			
Dimensions	Up to 3.5 in	650 µin	ASTM C128
Weight	Up to 340 g	0.13 g	
Compactor Marshall & Proctor[3] –			
Height of Drop	Up to 18 in	0.002 in	ASTM D6926, ASTM D698, ASTM D1557, ASTM D1883
Weight	Up to 10 lbs	0.016 lbs	
Rammer Diameter	Up to 4 in	650 µin	
LA Abrasion Machine[3] –			
Inside Diameter	Up to 28 in	800 µin	ASTM C131, ASTM C535
Inside Length	Up to 20 in	400 µin	
Average Dia. Of Charge	Up to 1.85 in	650 µin	
Average Mass of Charge	Up to 455 g	0.13 g	
Rotation Per Minute	Up to 33 rpm	0.08 rpm	
Liquid Limit Device & Groover[3] –			
Dimensions	Up to 150 mm	0.02 mm	ASTM D4318
Weight of Cup & Hanger	Up to 215 g	0.13 g	
Molds Cylinder[3] –			
Height	Up to 12 in	650 µin	ASTM C470
Diameter	Up to 6 in	650 µin	
Molds Marshall[3] –			
Dimensions	Up to 4 in	650 µin	ASTM D6926

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Molds Mortar Cubes[3] –			
Dimensions	Up to 2 in	650 µin	ASTM C109
Molds Proctor[3] –			
Volume	Up to 3000 ml	0.01 %	ASTM D698, ASTM D1557
Dimensions	Up to 5.9 in	650 µin	
Graduated Cylinder[3] –			
Volume	Up to 0.1 ft^3	0.01 %	ASTM E542
Slump Cone & Tamping Rod[3] –			
Cone Diameter	Up to 8 in	650 µin	ASTM C143
Cone Height	Up to 12 in	650 µin	
Cone Thickness	Up to 0.12 in	650 µin	
Rod Diameter	Up to 0.63 in	650 µin	
Rod Length	Up to 24 in	0.002 in	
Concrete Air Meter (Pressure Method) [3]	Up to 10 % of Air in Concrete	0.82 %	ASTM C231
Sieve[3]	(0.4 to 4) in	650 µin	CP-021 & ASTM E11, caliper

III. Dimensional

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Micrometers[3]	Up to 48 in	$0.6R + (3L + 10)$ µin	CP-010, gage blocks

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Calipers[3]	Up to 60 in	0.6*R* + (16*L* + 4.1) µin	CP-008, CP-010, gage blocks
Dial Indicators[3]	Up to 6 in	(*L* + 33) µin	CP-009, gage blocks
LVDTs[3]	Up to 0.5 in (> 0.5 to 12) in	0.6*R* + 5.5 µin 0.6*R* + (4.3*L* + 2) µin	CP-009, gage blocks & Certo vertical probe
Extensometers/ Deflectometers[3]	Up to 1 in	29 µin/in	CP-007, linear calibrator
Extensometer – ISO 9513[3]	Up to 50.8 mm (2 in.)	0.03 %	CP-139, Class .05 linear calibrator
Strain Rate Gages – Up to 0.01 in/in/min	(1 to 100) % strain	0.13 % strain	CP-143, ASTM E2309, E2658
Surface Plates[3] – Grade AA, A, B	(6 to 150) ft^2 Area Flatness	(0.25*DL* + 15) µin	CP-128, leveling system/planekator
Repeat-O-Meter	Up to 6 ft^2 Area Repeat Reading	23 µin	CP-128, repeat-o-meter
Pin Gages	Up to 4 in	(13*L* + 46) µin	CP-047, super mic, gage blocks, laser interferometer
Thread Plug Gages – Pitch Diameter	Up to 4 in	98 µin	CP-115, super mic, gage blocks, ULM
Plug Gages	Up to 4 in	(13*L* + 46) µin	CP-115, super mic, gage blocks, ULM

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Precision Levels	Up to 12 in	0.000 42 in/10 in	CP-115, sine bar, surface plate, gage blocks
Radius Gages, Angle	Up to 4 in	870 µin	CP-115, optical comparator, gage blocks
Internal Diameter/Ring Gages	Up to 6 in	(11*L* + 22) µin	CP-115, gage blocks, ID comparator
Micrometer Standards	Up to 48 in	(15*L* + 17) µin	CP-115, laser interferometer with 48 in super mic
Gage Blocks	Up to 4 in	(0.31*L* + 7.2) µin	CP-115 gage block comparator, 00 gage blocks
Thread Wires	(5 to 80) TPI	14 µin	CP-115, ULM laser interferometer
Height Gages[3]	Up to 40 in	0.6*R* + (8*L* + 220) µin	CP-115, surface plates, gage blocks
Rulers[3]	Up to 84 in	(62*L* + 56) µin	CP-115, laser interferometer
Tape Measures[3]	Up to 100 ft	0.6*R* + (16*L* + 2) µin	CP-115, laser interferometer
Straight Edges[3]	Up to 25 in	300 µin	CP-115, indicator & stand, tape & feeler gage
Optical Comparator[3] – Linear Measurement	8 in	270 µin	CP-064, gage blocks, glass scales

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Displacement Measurement[3] – (Feeler Gages, Film Thickness, Etc.)	Up to 0.25 in	(15*L* + 18) µin	CP-115
Prolifometers[3]	Up to 120 µin	5.0 µin	CP-028, surface roughness standards
Surface Roughness Specimens[3]	Up to 120 µin	5.1 µin	CP-028, profilometer

IV. Dimensional Inspection

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
1-Dimensional Inspection – Measure[3, 4]	Up to 12 in	650 µin	CP-115, ASTM & AASHTO procedures, calipers, rulers, straight edges, gage blocks

V. Electrical DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage – Generate[3]	Up to 329.9999 mV 330 mV to 3.299 999 V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1020) V	19 µV/V + 1 µV 11 µV/V + 2 µV 12 µV/V + 100 µV 18 µV/V + 0.2 mV 18 µV/V + 1.9 mV	CP-033, Fluke 5522A
DC Voltage – Measure[3]	Up to 209.999 999 mV 210 mV to 2.099 999 99 V (2.1 to 20.999 999 9) V (21 to 209.999 999) V (210 to 1000) V (100 to 9000) V	13 µV/V + 1.3µV 10 µV/V + 1.8 µV 3.3 µV/V + 300 µV 18 µV/V + 1.5 mV 51 µV/V + 3.8 mV 0.024 % + 39 mV	CP-033, Keithley 2002 Precision HV meter

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Current – Generate[3]	Up to 329.999 µA 330 µA to 3.2999 mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 2.199 99 A (2.2 to 11) A (11 to 20.5) A	0.014 % + 56 nA 0.009 % + 80 nA 0.01 % + 0.2 µA 0.01 % + 3.4 µA 0.03 % + 60 µA 0.05 % + 0.5 mA 0.1 % + 0.8 mA	CP-033, Fluke 5522A
Clamp-On Meters	(10 to 16.5) A (16.5 to 150) A (150 to 550) A (550 to 1025) A	0.59 % + 0.023 A 0.59 % + 0.16 A 0.59 % + 0.58 A 0.6 % + 0.58 A	CP-033, Fluke 5522A/50 turn coil
DC Current – Measure[3]	Up to 209.999 999 µA 210 µA to 2.099 999 99 mA (2.1 to 209.999 999) mA 210 mA to 2.1 A (2.2 to 5) A (5 to 14) A (14 to 30) A	350 µA/A + 5.3 nA 350 µA/A + 42 nA 0.035 µA/A + 0.5 µA 380 µA/A + 48 µA 200 µA/A + 16 µA 310 µA/A + 190 µA 760 µA + 1 mA	CP-033, Keithley 2002 CP-033, IET Labs DCCS
Resistance – Generate[3]	(0 to 10.99) Ω (11 to 32.999) Ω (33 to 109.999) Ω (110 to 329.999) Ω 330 Ω to 1.099 99 kΩ (1.1 to 3.299 99) kΩ (3.3 to 10.9999) kΩ (11 to 32.9999) kΩ (33 to 109.999) kΩ (110 to 329.999) kΩ 330 kΩ to 1.099 99 MΩ (1.1 to 3.299 99) MΩ (3.3 to 10.9999) MΩ (11 to 32.9999) MΩ (33 to 109.999) MΩ (110 to 330) MΩ 330 MΩ to 1 GΩ (1 to 10) GΩ (10 to 100) GΩ	40 µΩ/Ω + 1 mΩ 29 µΩ/Ω + 1.6 mΩ 27 µΩ/Ω + 1.6 mΩ 28 µΩ/Ω + 2.1 mΩ 28 µΩ/Ω + 2 mΩ 28 µΩ/Ω + 20 mΩ 28 µΩ/Ω + 20 mΩ 28 µΩ/Ω + 0.2 Ω 28 µΩ/Ω + 0.2 Ω 32 µΩ/Ω + 2 Ω 32 µΩ/Ω + 2 Ω 60 µΩ/Ω + 30 Ω 0.013 % + 50 Ω 0.03 % + 2.5 kΩ 0.05 % + 3 kΩ 0.3 % + 100 kΩ 1.5 % + 500 kΩ 5 mΩ/Ω 10 mΩ/Ω	CP-033, Fluke 5522A CP-033, decade box
Resistance – Generate Fixed Points[3]	1.0 mΩ 10.0 mΩ 100.0 mΩ	0.2 mΩ 0.16 mΩ 0.2 mΩ	Standard resistor

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Resistance – Measure[3]	(0 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ	13 μΩ/Ω + 27 nΩ 18 μΩ/Ω + 650 nΩ 9 μΩ/Ω + 620 nΩ 17 μΩ/Ω + 970 μΩ 35 μΩ/Ω + 140 μΩ 65 μΩ/Ω + 700 μΩ 250 μΩ/Ω + 19 Ω 600 μΩ/Ω + 440 Ω 2.1 mΩ/Ω + 21 kΩ	CP-033 Keithley 2002
AC Voltage – Generate[3]			
(1.0 to 32.99) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.08 % + 6 μV 0.015 % + 6 μV 0.2 % + 6 μV 0.1 % + 6 μV 0.35 % + 12 μV 0.8 % + 50 μV	CP-033, Fluke 5522A
(33 to 329.999) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.03 % + 8 μV 0.015 % + 9 μV 0.018 % + 9 μV 0.035 % + 8 μV 0.08 % + 32 μV 0.2 % + 70 μV	
(0.33 to 3.299 99) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.03 % + 56 μV 0.15 % + 67 μV 0.019 % + 64 μV 0.3 % + 24 μV 0.07 % + 100 μV	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.03 % + 0.7 mV 0.015 % + 0.6 mV 0.024 % + 0.6 mV 0.035 % + 0.6 mV 0.09 % + 1.6 mV	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.19 % + 2.8 mV 0.19 % + 7.9 mV 0.025 % + 6.3 mV 0.03 % + 6 mV 0.2 % + 50 mV	
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 14 mV 0.25 % + 10 mV 0.3 % + 10 mV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage – Measure[3]			
Up to 200 mV	(10 to 50) Hz (50 to 100) Hz (100 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz (100 to 200) kHz (0.2 to 1) MHz (1 to 2) MHz	0.25 % + 30 µV 0.06 % + 30 µV 0.02 % + 20 µV 0.02 % + 20 µV 0.025 % + 20 µV 0.034 % + 71 µV 0.3 % + 30 µV 0.75 % + 50 µV 2 % + 200 µV 5 % + 400 µV	CP-033, Keithley 2002
200 mV to 2 V	(10 to 50) Hz (50 to 100) Hz (100 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz (100 to 200) kHz (0.2 to 1) MHz (1 to 2) MHz	0.035 % + 300 µV 0.025 % + 300 µV 0.035 % + 300 µV 0.02 % + 200 µV 0.025 % + 200 µV 0.05 % + 210 µV 0.3 % + 300 µV 0.75 % + 500 µV 2 % + 2 mV 5 % + 4 mV	
(2 to 20) V	(20 to 50) Hz (50 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz (100 to 200) kHz (0.2 to 1) MHz (1 to 2) MHz	0.06 % + 3.2 mV 0.035 % + 3.2 mV 0.03 % + 3.2 mV 0.04 % + 3.3 mV 0.05 % + 3.1 mV 0.01 % + 76 mV 0.3 % + 3.1 mV 0.75 % + 5 mV 4 % + 40 mV 7 % + 40 mV	
(20 to 200) V	(1 to 10) Hz (10 to 50) Hz (50 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.13 % + 30 mV 0.09 % + 30 mV 0.05 % + 30 mV 0.05 % + 30 mV 0.06 % + 30 mV 0.065 % + 71 mV 0.10 % + 30 mV 0.50 % + 30 mV	
(200 to 900) V	(20 to 50) Hz (50 to 100) Hz (100 to 2000) Hz (2 to 10) kHz	0.09 % + 110 mV 0.05 % + 110 mV 0.05 % + 110 mV 0.06 % + 110 mV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage – Measure[3] (cont)			
(200 to 900) V	(10 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.08 % + 110 mV 0.1 % + 130 mV 0.5 % + 110 mV	CP-033, Keithley 2002
500 V to 9 kV 1 kV	50 & 60 Hz 400 Hz	0.05 % + 5 V 0.62 V	CP-033, precision HV meter
AC Current – Generate[3]			
(0.029 to 0.329 99) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.2 % + 0.1 µA 0.15 % + 0.1 µA 0.13 % + 0.1 µA 0.3 % + 0.15 µA 0.8 % + 0.2 µA 1.6 % + 0.4 µA	CP-033, Fluke 5522A
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.17 % + 1.6 µA 0.13 % + 0.16 µA 0.1 % + 0.16 µA 0.2 % + 0.20 µA 0.5 % + 0.3 µA 1.0 % + 0.6 µA	
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 2 µA 0.09 % + 2 µA 0.04 % + 2 µA 0.08 % + 2 µA 0.2 % + 3 µA 0.4 % + 4 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % + 0.22 µA 0.09 % + 20 µA 0.04 % + 21 µA 0.1 % + 50 µA 0.16 % + 100 µA 0.32 % + 200 µA	
(0.33 to 1.099 99) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 230 µA 0.05 % + 200 µA 0.6 % + 100 µA 2.5 % + 500 µA	
(1.1 to 2.999 99) A	10 to 45) Hz (45 to 1) kHz 1 kHz to 5 kHz (5 to 10) kHz	0.19 % + 530µA 0.06 % + 200 µA 0.6 % + 1000 µA 2.5 % + 5000 µA	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current – Generate[3] (cont)			
(3 to 10.9999) A	(45 to 100) Hz (100 to 1) kHz 1 kHz to 5 kHz	0.06 % + 2.1 mA 0.1 % + 2 mA 3 % + 2 mA	CP-033, Fluke 5522A
(11 to 20.5) A	(45 to 100) Hz (100 to 1) kHz (100 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	
Toroidal Clamp-On Meters:			
(10 to 16.5) A	(45 to 65) Hz (65 to 440) Hz	0.34 % + 0.0035 A 0.92 % + 0.0035 A	CP-033, 5522A w/ 50 turn coil
(16.5 to 150) A	(45 to 65) Hz (65 to 440) Hz	0.35 % + 0.029 A 0.92 % + 0.032 A	
(150 to 550) A	(45 to 65) Hz (65 to 440) Hz	0.35 % + 0.1 A 0.93 % + 0.12 A	
(550 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.36 % + 0.1 A 0.93 % + 0.12 A	
Non-Toroidal Clamp-On Meters:			
(10 to 16.5) A	(45 to 65) Hz (65 to 440) Hz	0.66 % + 0.035 A 1.2 % + 0.035 A	
(16.5 to 150) A	(45 to 65) Hz (65 to 440) Hz	0.66 % + 0.29 A 1.2 % + 0.29 A	
(150 to 550) A	(45 to 65) Hz (65 to 440) Hz	0.66 % + 1 A 1.2 % + 1 A	
(550 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.67 % + 1 A 1.2 % + 1 A	
AC Current – Measure[3]			
(29 to 200) µA	(20 to 50) Hz (50 to 200) Hz (0.200 to 1) kHz (1 to 10) kHz	0.38 % + 19 nA 0.021 % + 19 nA 0.045 % + 18 nA 0.57 % + 18 nA	CP-033, multimeter

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current – Measure[3] (cont.)			CP-033, multimeter
(0.20 to 2) mA	(20 to 50) Hz (50 to 200) Hz (0.200 to 1) kHz (1 to 10) kHz	0.33 % + 19 µA 0.16 % + 19 µA 0.14 % + 18µA 0.14 % + 18 µA	
(2 to 20) mA	(20 to 50) Hz (50 to 200) Hz (0.200 to 1) kHz (1 to 10) kHz	0.35 % + 17 µA 0.17 % + 17 µA 0.14 % + 17 µA 0.14 % + 17 µA	
(20 to 200) mA	(20 to 50) Hz (50 to 200) Hz (0.200 to 1) kHz (1 to 10) kHz	0.35 % + 17 µA 0.17 % + 17 µA 0.14 % + 17 µA 0.17 % + 17 µA	
(0.20 o 2.0) A	(20 to 50) Hz (50 to 200) Hz (0.200 to 1) kHz (1 to 10) kHz	0.4 % + 17 mA 0.23 % + 17 mA 0.35 % + 17 mA 0.52 % + 17 mA	
(1 to 10) A	(0.01 to 5) kHz	0.17 % + 69 mA	
Capacitance – Generate			
(0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) µF (1.1 to 3.299 99) µF (3.3 to 10.9999) µF (11 to 32.9999) µF (33 to 109.999) µF (110 to 329.999) µF (0.33 to 1.099 99) mF (1.1 to 3.299 99) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	(10 to 10 000) Hz (10 to 3000) Hz (10 to 1000) Hz (10 to 1000) Hz (10 to 1000) Hz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 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	0.6 % + 0.01 nF 0.6 % + 0.01 nF 0.31 % + 0.1 nF 0.31 % + 0.1 nF 0.31 % + 0.3 nF 0.31 % + 1 nF 0.31 % + 3 nF 0.31 % + 10 nF 0.49 % + 30 nF 0.55 % + 100 nF 0.55 % + 300 nF 0.55 % + 1 µF 0.55 % + 3 µF 0.56 % + 10 µF 0.91 % + 30 µF 1.4 % + 100 µF	CP-033, Fluke 5522A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Oscilloscopes –			Fluke 5522A w SC600
DC:			
50 Ω	(0 to +/- 6.6) V	0.26 % + 40 µV	
1 MΩ	(0 to +/- 130) V	0.06 % + 40 µV	
Square Wave:			
50 Ω	(0 to +/- 6.6) V 10 Hz to 10 kHz	0.26 % + 40 µV	
1 M Ω	(0 to +/- 130) V 10 Hz to 10 kHz	0.2 % + 40 µV	
Level Sine Wave:			
Amplitude (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	2.0 % + 300 µV 2.5 % + 300 µV 5.0 % + 300 µV	
Flatness (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	2.0 % + 100 µV 3.0 % + 100 µV 5.0 % + 100 µV	
Time Marker	2 ns to 20 ms 50 ms to 5 s	3 µs/s (30 + 1000*t*) µs/s	**t* represents the time
Electrical Simulation of Thermocouples[3] – Generate & Measure			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1800) °C	0.77 °C 0.72 °C 0.70 °C 0.71 °C	CP-013, Fluke 5522A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.32 °C 0.27 °C 0.32 °C 0.50 °C 0.84 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °C 0.18 °C 0.15 °C 0.17 °C 0.23 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.21 °C 0.15 °C 0.19 °C 0.24 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouples[3] (cont) –			
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.34 °C 0.19 °C 0.17 °C 0.27 °C 0.41 °C	CP-013, Fluke 5522A
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.31 °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	0.40 °C 0.21 °C 0.20 °C 0.20 °C 0.28 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.85 °C 0.72 °C 0.71 °C 0.75 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.55 °C 0.35 °C 0.33 °C 0.40 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.64 °C 0.25 °C 0.17 °C 0.15 °C	
Electrical Simulation of RTDs[3]			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 630) °C (630 to 800) °C	0.07 °C 0.09 °C 0.10 °C 0.12 °C 0.25 °C	CP-013, Fluke 5522A
Pt 3926, 100Ω	(-200 to 0) °C (0 to 300) °C (300 to 630) °C	0.11 °C 0.14 °C 0.16 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of RTDs[3] (cont)			
Pt 3916, 100Ω	(-200 to -190) °C (-190 to 0) °C (0 to 260) °C (260 to 600) °C (600 to 630) °C	0.25 °C 0.05 °C 0.07 °C 0.10 °C 0.23 °C	CP-013, Fluke 5522A
Pt 385, 200	(-200 to 260) °C 260 °C to 600 °C (600 to 630) °C	0.14 °C 0.18 °C 0.21 °C	
Pt 385, 500 Ω	(-200 to 260) °C (260 to 400) °C (400 to 630) °C	0.12 °C 0.13 °C 0.15 °C	
Pt 385, 1000Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.14 °C 0.15 °C 0.27 °C	
Pt Ni, 120Ω	(-80 to 100) °C (100 to 260) °C	0.13 °C 0.17 °C	
Eddy Current (IACS) – Conductivity Meters	(10 to 20) %IACS (20 to 40) %IACS (40 to 60) %IACS	0.36 % IACS 0.36 % IACS 0.46 % IACS	Eddy Current Conductivity Standards, ASTM E1004

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Hydrometry – Specific Gravity, Hydrometers & Equivalent Values in Other Hydrometer Scales	(> 0.631 to 2) SG	0.000 54 SG	CP-020 hydrometer standards, PRT, & ASTM E126
Volume – Volume Measuring Equipment[3]	Up to 0.1 ft³ (0.1 to 1.5) ft³	0.01 % 0.013 %	CP-038 thermometer, balance

VII. Ionizing Radiation & Radioactivity

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Nuclear Density Gages[3]	110 PCF 129 PCF 167 PCF Low Range: 20.03 PCF	0.25 % 0.57 % 0.15 % 1.0 %	Density blocks, moisture blocks

VIII. Mechanical

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Test Machine Alignment[3]	Up to 30 000 lbf Axial Load	1.1 % Bending	CP-096, ASTM E1012 strain recorder & strain gauge bars
Crosshead Speed[3]	Up to 24 inches/min	0.0013 in/min	CP-141 ASTM E2658 Dial indicator stopwatch
Crosshead Position[3]	Up to 4” 4” to 24”	0.000 30 in 0.0013 in	CP-115 ASTM E2309 Dial indicator Height gage
Load Rate[3]	Up to 50,000 Lbf/min	0.24 %	CP-141, ASTM E2309, ASTM E2658
Pneumatic/Hydraulic Gage Pressure [3] – Measuring Equipment	(-10 to 10) in·H_2O Up to 36 psig Up to 300 psig Up to 3000 psig Up to 10 000 psig	0.012 in·H_2O 0.057 % + 0.0035 psig 0.13 psig 0.058 % + 0.26 psig 0.1 % + 2.7 psig	CP-003, digital pressure indicators
Vacuum[3]	Up to 30 in-Hg	0.32 %	CP-005, digital manometers

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
Manometers, Absolute Pressure[3]	(5 to 1000) mmHg ABS	0.25 mmHg	CP-005, digital manometers
Durometer –			CP-017, electronic balance, gage blocks, optical inspection under magnification
Type A, B, O[3]	Up to 100 Points (56.08 to 820.87) g	4.7 grams	
Type C, D, DO[3]	Up to 100 Points Up to 4.53 kg	26 grams	
Indenter Display	(0.096 to 0.100) in	0.032 in	
Force – Load Cells Compression	Up to 2000 lbf (2000 to 10 000) lbf (10 000 to 50 000) lbf (50 000 to 100 000) lbf (100 000 to 600 000) lbf	0.039 % 0.042 % 0.039 % 0.038 % 0.059 %	CP-030, ASTM E74, load cells/weights
Force – Load Cells Tension	Up to 2000 lbf (2000 to 10 000) lbf (10 000 to 50 000) lbf (50 000 to 100 000) lbf	0.039 % 0.042 % 0.039 % 0.038 %	CP-030, ASTM E74, load cells/weights
Force Devices & Machines – Compression[3]	Up to 2000 lbf (2000 to 10 000) lbf (10 000 to 50 000) lbf (50 000 to 100 000) lbf (100 000 to 600 000) lbf (600 000 to 1 000 000) lbf	0.19 % 0.19 % 0.19 % 0.19 % 0.2 % 0.45 %	CP-001, ASTM E4, load cells/weights
Force Devices & Machines – Tension[3]	Up to 2500 lbf (2500 to 25 000) lbf (25 000 to 100 000) lbf (100 000 to 200 000) lbf	0.2 % 0.19 % 0.19 % 0.19 %	CP-001, ASTM E4, load cells/weights
Force ISO 7500-1 – Compression[3] – Measure & Measuring Equipment	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.09 % 0.11 % 0.11 %	CP-140, Class .05 load cells

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
Force ISO 7500-1 – Tension[3] – Measure & Measuring Equipment	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.12 % 0.07 % 0.07 %	CP-140, Class .05 load cells
Force ISO 7500-2 – Tension[3] – Stress Rupture	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.12 % 0.07 % 0.07 %	CP-141, Class .05 load cells
Dynamic Force Devices & Machines[3]	Up to 30 000 lbf	0.77 %	CP-001 (ASTM E-467) Dynamic Force Transducer
Rotational Speed – Measure	(5 to 99 999) RPM	0.058 % + 0.061 RPM	Digital tachometer
Torque – Wrenches, Screw Drivers, & Multipliers[3]	Up to 50 lbf·in (> 50 to 750) lbf·in (25 to 250) lbf·ft (> 250 to 1000) lbf·ft	0.55 % 0.55 % 0.56 % 0.59 %	CP-006 torque transducers
Torque Transducers	Up to 100 lbf·in (> 100 to 750) lbf·in Up to 250 lbf·ft (> 250 to 1000) lbf·ft	0.3 % 0.15 % 0.07 % 0.5 %	CP-006, weights & arms
Balances/Scales[3]	Up to 150 kg Up to 5000 lb	0.6*R* + 0.0003 % 0.6*R* + 0.01 %	CP-002, class 1, 4, & F weights
Mass, Direct Measure3	Up to 34 kg	2 g	CP-019, balance or scale
Indirect Verification of Brinell Hardness[3]	HBW (126 to 758)	7.5 HBW	CP-014 Brinell hardness blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Micro Hardness[3] – Knoop Vickers	 250 to 650 HK > 650 HK (100 to 600) HV (> 600 to 1100) HV	 15 HK 20 HK 25 HV 19 HV	CP-004, hardness blocks
Indirect Verification of Rockwell Harness3	HRA: Low Medium High HRB: Low Medium High HRC: Low Medium High HRE: Low Medium High HRF: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High	 0.26 HRA 0.24 HRA 0.20 HRA 0.36 HRB 0.37 HRB 0.44 HRB 0.54 HRC 0.48 HRC 0.48 HRC 0.64 HRE 0.64 HRE 0.65 HRE 0.53 HRF 0.61 HRF 0.60 HRF 0.47 HR15N 0.29 HR15N 0.30 HR15N 0.46 HR30N 0.44 HR30N 0.32 HR30N 0.50 HR45N 0.23 HR45N 0.24 HR45N	CP-004 Rockwell hardness blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Rockwell Hardness[3] (cont.)	HR15T: Low Medium High HR30T: Low Medium High HR45T: Low Medium High	 0.46 HR15T 0.40 HR15T 0.38 HR15T 0.58 HR30T 0.39 HR30T 0.40 HR30T 0.64 HR45T 0.64 HR45T 0.46 HR45T	CP-004 Rockwell hardness blocks

IX. Thermodynamics

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Ovens, Freezers, Environmental Chambers, Autoclaves, Water Baths, & Sealers[3] – Measure	(-100 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 400) °C (400 to 600) °C	0.30 °C 0.11 °C 0.14 °C 0.16 °C 0.17 °C	CP-011, thermocouple/RTD meters
Temperature -Measure & Measuring Equipment[3]	(-100 to 50) °C (50 to 100) °C (100 to 200) °C (200 to 400) °C (400 to 600) °C	0.062 °C 0.028 °C 0.043 °C 0.050 °C 0.066 °C	CP-012 RTD meters, probes, baths
Thermocouples – Direct Comparison[3]	(-15 to 110) °C (28 to 500) °C (500 to 1200) °C	0.14 °C 0.75 °C 1.8 °C	ASTM E220, ASTM E230, CP-012 with Tube Furnace, Dry Wells, SPRT
IR Thermometers/ Pyrometers[3]	(28 to 500) °C (500 to 1200) °C	1.2 °C 2 °C	CP-012, black body,PRT, reference pyrometer, $\varepsilon = 0.95$, $\lambda = (8 \text{ to } 14)$ µm

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Temperature Uniformity (Up to 60 Channels)[3] – Measure	(-196 to 0) °C (0 to 1093) °C (1093 to 1315) °C	0.82 °C 0.98 °C 1.9 °C	CP-011, data loggers, thermocouples AMS 2750 & CQI-9
Relative Humidity[3] – Measure & Measuring Equipment	(10 to 95) % RH	1.0 % RH	CP-031, digital hygrometer

X. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Frequency – Measuring Instruments	(0.01 to 600) MHz	3 µHz/Hz + 6 µHz	Multifunction calibrator, scope calibrator
Frequency – Measure[3]	(10 to 999) Hz (1 to 99) kHz 100 kHz to 100 MHz (100 to 600) MHz	1 Hz 0.1 Hz 1.2 Hz 2 Hz	Frequency counter
Timers, Stop Watches[3]	Up to 24 hrs	34 ms	CP-032 Bench timer/stopwatch/data logger
Non-Contact Tachometers & Rotational Speed Measuring Equipment[3]	Up to 7200 RPM (7200 to 72 000) RPM (72 000 to 99 999) RPM	0.0028 % + 0.07 RPM 0.001 % + 0.2 RPM 0.0003 % + 1 RPM	CP-033, Fluke 5522A

SATELLITE

CAL-CERT COMPANY
120 South Chaparral Court, Suite 110
Anaheim Hills, CA 92808
Brett Bohannon Phone: 208 860 3981

CALIBRATION

I. Chemical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Conductivity Meters[3]	98.80 µS/cm 9.21 µS/cm	2.3 µS/cm 0.65 µS/cm	CP-024 conductivity standards

II. Construction Material Laboratory Equipment

Parameter/Equipment	Range	CMC[2] (±)	Comments
CBR Mold & Spacer[3] –			
Dimensions	Up to 8 in	650 µin	ASTM D1883
Volume	Up to 184 in^3	0.13 in^3	
Conical Mold & Tamper[3] –			
Dimensions	Up to 3.5 in	650 µin	ASTM C128
Weight	Up to 340 g	0.13 g	
Compactor Marshall & Proctor[3] –			
Height of Drop	Up to 18 in	0.002 in	ASTM D6926, ASTM D698, ASTM D1557, ASTM D1883
Weight	Up to 10 lbs	0.016 lbs	
Rammer Diameter	Up to 4 in	650 µin	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Compactor Marshall & Proctor[3] –			
Height of Drop	Up to 18 in	0.002 in	ASTM D6926, ASTM D698, ASTM D1557, ASTM D1883
Weight	Up to 10 lbs	0.016 lbs	
Rammer Diameter	Up to 4 in	650 µin	
LA Abrasion Machine[3] –			
Inside Diameter	Up to 28 in	800 µin	ASTM C131, ASTM C535
Inside Length	Up to 20 in	400 µin	
Average Dia. of Charge	Up to 1.85 in	650 µin	
Average Mass of Charge	Up to 455 g	0.13 g	
Rotation Per Minute	Up to 33 rpm	0.08 rpm	
Liquid Limit Device & Groover[3] –			
Dimensions	Up to 150 mm	0.02 mm	ASTM D4318
Weight of Cup & Hanger	Up to 215 g	0.13 g	
Molds Cylinder[3] –			
Height	Up to 12 in	650 µin	ASTM C470
Diameter	Up to 6 in	650 µin	
Molds Marshall[3] –			
Dimensions	Up to 4 in	650 µin	ASTM D6926
Molds Mortar Cubes[3] –			
Dimensions	Up to 2 in	650 µin	ASTM C109

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Molds Proctor[3] –			
Volume	Up to 3000 ml	0.01 %	ASTM D698, ASTM D1557
Dimensions	Up to 5.9 in	650 µin	
Graduated Cylinder[3] –			
Volume	Up to 0.1 ft^3	0.01 %	ASTM E542
Slump Cone & Tamping Rod[3] –			
Cone Diameter	Up to 8 in	650 µin	ASTM C143
Cone Height	Up to 12 in	650 µin	
Cone Thickness	Up to 0.12 in	650 µin	
Rod Diameter	Up to 0.63 in	650 µin	
Rod Length	Up to 24 in	Up to 24 in	
Concrete Air Meter (Pressure Method)[3]	Up to 10 of Air in Concrete	0.82 %	ASTM C231

III. Dimensional

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Calipers[3]	Up to 60 in	$0.6R + (16L + 4.1)$ µin	CP-008, gage blocks
Micrometers – External[3]	Up to 48 in	$0.6R + (3L + 10)$ µin	CP-010, gage blocks
Dial Indicator – Mechanical/Electronic[3]	Up to 6 in	$0.6R + (L + 33)$ µin	CP-009, gage blocks

Parameter/Equipment	Range	CMC[2, 6, 7] (±)	Comments
Extensometers[3]	Up to 1 in	29 µin/inch	CP-007, linear calibrator
Extensometers (ISO 9513)[3]	Up to 50.8 mm (2 in.)	0.03 %	CP-139, Class .05 linear calibrator
Strain Rate Gages[3]	(0.01 to 1) in/min	0.17 %	CP-143, ASTM E2309, E2658
Depth Gage[3]	Up to 8 in	$0.6R + (16L + 4.1)$ µin	CP-115, gage blocks
Ring Gage	Up to 6 in	$(11L + 22)$ µin	CP-115, comparator with gage blocks
Plug Gages	Up to 4 in	$(13L + 46)$ µin	CP-115, gage blocks & comparator
Pin Gages	Up to 4 in	$(13L + 46)$ µin	CP-115, super mic, gage blocks
Micrometer Standards	Up to 6 in (> 6 to 12) in (> 12 to 24) in (> 24 to 36) in	$(15L + 18)$ µin	CP-115, height master, riser blocks, gage blocks, & electronic pick-up
Electronic Indicators	0.25 in	$0.6R + 6$ µin	CP-115, gage blocks
Height Gages[3]	Up to 40 in	$0.6R + (8L + 220)$ µin	CP-115, end standards & electronic pick-up with µ-checker
Rulers[3]	Up to 84 in	$(62L + 56)$ µin	CP-115, gage blocks
Tape Measures[3]	Up to 100 ft	$0.6R + (62L + 81)$ µin	CP-115, standard rule, gage blocks

Parameter/Equipment	Range	CMC[2, 6, 9] (±)	Comments
Riser Blocks	Up to 12 in	(8.4*L* + 150) µin	CP-115, gage blocks & µ-checker
Microscope[3]	X to Y Range: (6 x 4) in 0.0001 in Resolution	1600 µin	CP-115, gage blocks & image reticles
Super Micrometer[3]	Up to 1 in	7 µin	CP-115, gage blocks
Precision Levels	Up to 12 in	0.000 42 in/10 in	CP-115, sine bar, surface plate, gage blocks
Protractor	(0 to 340)°	0.013°	CP-115, angle gage blocks
Displacement Measurement[3] – (Feeler Gages, Film Thickness, Etc.)	Up to 0.25 in	(15*L* + 18) µin	CP-115

IV. Dimensional Inspection

Parameter/Equipment	Range	CMC[2] (±)	Comments
1 – Dimensional Inspection[3, 4]	Up to 12 in	650 µin	CP-115, ASTM & AASHTO procedures, calipers, rulers, straight edges, & gage blocks

V. Electrical DC/Low Frequency

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current – Generate[3]			
(0.029 to 0.329 99) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.28 % + 0.18 µA 0.15 % + 0.17 µA 0.15 % + 0.29 µA 0.46 % + 0.17 µA 1.5 % + 0.17 µA	CP-033, multifunction calibrator
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 % + 0.47 µA 0.12 % + 0.4 µA 0.12 % + 0.4 µA 0.23 % + 0.4 µA 0.69 % + 0.3 µA	
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 % + 4 µA 0.12 % + 3.5 µA 0.11 % + 3.4 µA 0.23 % + 3.5 µA 0.7 % + 3.4 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.23 % + 41 µA 0.12 % + 36 µA 0.11 % + 37 µA 0.23 % + 35 µA 0.7 % + 35 µA	
(0.33 to 2.199 99) A	(10 to 20) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.23 % + 350 µA 0.12 % + 350 µA 0.87 % + 350 µA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.07 % + 2400 µA 0.12 % + 2400 µA 0.38 % + 2400 µA	
(11 to 550) A:			
Toroidal	(40 to 400) Hz	1.3 % + 120 mA	Fluke 5500A/coil 50 turns
Other Clamps	(40 to 400) Hz	1.5 % + 1 A	

Parameter/Range	Frequency	CMC[2, 5] (±)	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	0.017 % + 46 nA 0.029 % + 26 nA 0.065 % + 25 nA 0.44 % + 24 nA	CP-033, Fluke 8508A
(0.200 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.015 % + 47 nA 0.029 % + 26 nA 0.065 % + 25 nA 0.44 % + 25 nA	
> 200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.029 % + 230 µA 0.029 % + 230 µA 0.07 % + 230 µA	
(> 2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.09 % + 2.3 µA 0.29 % + 2.3 mA	
(0 to 2500) A	60 Hz	0.33 % + 110 mA	Current shunt & DMM
AC Voltage – Generate[3]			
(1.0 to 32.99) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.4 % + 23 µV 0.17 % + 23 µV 0.23 % + 23 µV 0.29 % + 23 µV 0.4 % + 38 µV 1.1 % + 95 µV	CP-033, multifunction calibrator
(33 to 329.999) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.29 % + 58 µV 0.057 % + 25 µV 0.12 % + 24 µV 0.18 % + 47 µV 0.28 % + 200 µV 0.8 % + 380 µV	
(0.33 to 3.299 99) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.17 % + 360 µV 0.034 % + 67 µV 0.09 % + 100 µV 0.16 % + 360 µV 0.28 % + 1.9 mV 0.58 % + 3.8 mV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage – Generate[3] (cont)			
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.17 % + 650 µV 0.046 % + 0.8 mV 0.09 % + 3.1 mV 0.22 % + 5.9 mV 0.28 % + 20 mV	CP-033, multifunction calibrator
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.06 % + 1.4 mV 0.09 % + 1.4 mV 0.1 % + 1.1 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.06 % + 180 µV 0.23 % + 130 µV 0.23 % + 640 µV	
AC Voltage – Measure[3]			
(0 to 200) mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 17 µV 0.014 % + 5 µV 0.012 % + 4.6 µV 0.012 % + 2.3 µV 0.012 % + 5 µV 0.04 % + 9.3 µV 0.08 % + 23 µV	CP-033, Fluke 8508A
> 200 mV to 200 V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.012 % + 14 µV 0.012 % + 2.3 µV 0.01 % + 2.3 µV 0.007 % + 2.3 µV 0.009 % + 2.3 µV 0.023 % + 4.6 µV 0.06 % + 23 µV 0.35 % + 230 µV 1.2 % + 2.3 mV	
(> 200 to 1050) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.012 % + 60 mV 0.012 % + 17 mV 0.009 % + 17 mV 0.023 % + 35 mV 0.058 % + 170 mV	
(> 1 to 20) kV	(20 to 100) Hz	0.05 % + 5 V	Precision HV meter

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Capacitance – Generate[3]	(0.33 to 0.4999) nF (0.5 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) µF (1.1 to 3.2999) µF (3.3 to 10.999) µF (11 to 32.999) µF (33 to 109.99) µF (110 to 329.99) µF (330 to 1.1) mF	0.56 % + 12 pF 0.57 % + 12 pF 0.58 % + 12 pF 0.56 % + 15 pF 0.29 % + 120 pF 0.29 % + 120 pF 0.29 % + 350 pF 0.29 % + 1.2 nF 0.4 % + 3.5 nF 0.4 % + 12 nF 0.46 % + 35 nF 0.58 % + 120 nF 0.81 % + 350 nF 1.2 % + 350 nF	CP-033, standard capacitor, decade capacitor Multifunction calibrator
DC Current – Generate[3]	(0 to 3.299 99) mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 2.199 99 A (2.2 to 11) A (11 to 16.5) A (16.5 to 150) A (150 to 500) A	0.013 % + 0.5 µA 0.01 % + 0.2 µA 0.01 % + 3.4 µA 0.03 % + 60 µA 0.05 % + 0.5 mA 0.29 % + 2.3 mA 0.29 % + 17 mA 0.29 % + 58 mA	CP-033, multifunction calibrator Fluke 5500A/coil 50 turns
DC Current – Measure[3]	(0 to 2) mA (> 2 to 20) mA (> 20 to 200) mA > 200 mA to 2 A (> 2 to 20) A (0 to 2500) A	6.5 µA/A + 0.4nA 6.5 µA/A + 4 nA 8 µA/A + 40 nA 170 µA/A + 16 µA 370 µA/A + 600 µA 430 µA/A + 680 µA	CP-033, Fluke 8508A Current shunt & DMM
DC Voltage – Generate[3]	(0 to 329.9999) mV 330 mV to 3.299 999 V (3.3 to 32.999 99) V (33 to 329.9999) V (100 to 1020) V	60 µV/V + 3 µV 50 µV/V + 5 µV 50 µV/V + 50 µV 55 µV/V + 500 µV 55 µV/V + 1.5 mV	CP-033, multifunction calibrator

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Voltage – Measure[3]	(0 to 200) mV > 200 mV to 2 V (> 2 to 20) V (> 20 to 200) V (> 200 to 1000) V (20 to 20 000) V	2.7 µV/V + 100 nV 2.7 µV + 0.4µV 2.7 µV + 4 µV 4 µV + 40 µV 4 µV + 0.5 mV 0.024 % + 39 mV	CP-033, Fluke 8508A Precision HV meter
Resistance – Generate[3]	(0 to 10.99) Ω (11 to 32.999) Ω (33 to 109.999) Ω (110 to 329.999) Ω 330 Ω to 1.099 99 kΩ (1.1 to 3.299 99) kΩ (3.3 to 10.9999) kΩ (11 to 32.9999) kΩ (33 to 109.999) kΩ (110 to 329.999) kΩ 330 kΩ to 1.099 99 MΩ (1.1 to 3.299 99) MΩ (3.3 to 10.9999) MΩ (11 to 32.9999) MΩ (33 to 109.999) MΩ (110 to 330) MΩ	0.014 % + 0.009 Ω 0.14 % + 0.017 Ω 0.01 % + 0.017 Ω 0.01 % + 0.017 Ω 0.01 % + 0.07 Ω 0.004 % + 0.6 Ω 0.009 % + 0.9 Ω 0.01 % + 0.8 Ω 0.013 % + 7 Ω 0.014 % + 7 Ω 0.017 % + 64 Ω 0.009 % + 610 Ω 0.069 % + 730 Ω 0.12 % + 660 Ω 0.58 % + 6.4 kΩ 0.58 % + 20 kΩ	CP-033, multifunction calibrator
Resistance – Measure[3]	(0 to 2) Ω (> 2 to 20) Ω (> 20 to 200) Ω > 200 Ω to 2 kΩ (> 2 to 20) kΩ (> 20 to 200) kΩ > 200 kΩ to 2 MΩ (> 2 to 20) MΩ (> 20 to 200) MΩ > 200 MΩ to 2 GΩ (> 2 to 20) GΩ	2 µΩ/Ω + 96 µΩ 5 µΩ/Ω + 120 µΩ 6.7 µΩ/Ω + 390 µΩ 6 µΩ/Ω + 790 µΩ 8 µΩ/Ω + 5.8 mΩ 8.1 µΩ/Ω + 58 mΩ 8 µΩ/Ω + 580 mΩ 8.1 µΩ/Ω + 1.2 kΩ 10 µΩ/Ω + 120 Ω 35 µΩ/Ω + 120 kΩ 35 µΩ/Ω + 1.2 MΩ	CP-033, Fluke 8508A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples – Generate & Measure[3]			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1800) °C	0.77 °C 0.72 °C 0.70 °C 0.71 °C	CP-013, 5500A multifunction calibrator
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.32 °C 0.27 °C 0.32 °C 0.50 °C 0.84 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °C 0.18 °C 0.15 °C 0.17 °C 0.23 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.21 °C 0.15 °C 0.19 °C 0.24 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.34 °C 0.19 °C 0.17 °C 0.27 °C 0.41 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.31 °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	0.40 °C 0.21 °C 0.20 °C 0.20 °C 0.28 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouples – Generate & Measure[3] (cont)–			
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.85 °C 0.72 °C 0.71 °C 0.75 °C	CP-013, 5500A multifunction calibrator
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.55 °C 0.35 °C 0.33 °C 0.40 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.64 °C 0.25 °C 0.17 °C 0.15 °C	
Electrical Simulation of RTDs[3] –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 630) °C (630 to 800) °C	0.07 °C 0.09 °C 0.10 °C 0.12 °C 0.25 °C	CP-013, 5500A multifunction calibrator
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 300) °C (300 to 630) °C	0.11 °C 0.14 °C 0.16 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 0) °C (0 to 260) °C (260 to 600) °C (600 to 630) °C	0.25 °C 0.05 °C 0.07 °C 0.10 °C 0.23 °C	
Pt 385, 200 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.12 °C 0.13 °C 0.15 °C	
Pt 385, 500 Ω	(-200 to 260) °C (260 to 400) °C (400 to 630) °C	0.12 °C 0.13 °C 0.15 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of RTDs[3] (cont)			
Pt 385, 1000 Ω	(-200 to 260) °C (260 to 600) °C (600 to 630) °C	0.14 °C 0.15 °C 0.27 °C	CP-013, 5500A multifunction calibrator
Pt Ni 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.13 °C 0.17 °C	

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Rotational/Cups Viscometers[3]	Up to 3000 cp	0.6 % cp	CP-100, certified viscosity reference standards
Volume –Measuring Equipment[3]	Up to 0.01 ft² (0.01 to 0.05) ft² (0.05 to 1.2) ft²	0.09 % 0.027 % 0.014 %	CP-038 thermometer, balance

VII. Mechanical

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Test Machine Alignment[3]	Up to 30 000 lbf Axial Load	1.1 % Bending	CP-096, ASTM E1012 strain recorder & strain gauge bars
Crosshead Speed[3]	Up to 24 inches/min	0.0026 in/min	CP-143 ASTM E2658 dial indicator, stopwatch
Crosshead Position[3]	Up to 4 in (4 to 24) in	0.000 30 in 0.000 90 in	CP-115 ASTM E2309 dial indicator height gage

Parameter/Equipment	Range	CMC[2, 6, 7, 9] (±)	Comments
Load Rate[3]	Up to 50 000 lbf/min	0.24 %	CP-143, ASTM E2309, ASTM E2658
Mass	5 kg 2 kg 1 kg 100 g 50 g 30 g 20 g 10 g 5 g 3 g 2 g 1 g 500 mg 300 mg 200 mg 100 mg 50 mg 30 mg 20 mg 10 mg 50 lb	58 mg 58 mg 1.6 mg 0.15 mg 0.07 mg 0.04 mg 0.03 mg 0.031 mg 0.023 mg 0.022 mg 0.02 mg 0.021 mg 0.013 mg 0.008 mg 0.008 mg 0.01 mg 0.021 mg 0.013 mg 0.01 mg 0.015 mg 140 mg	CP-019, analytical balance
Mass – Direct Measure[3]	Up to 34 kg	2 g	CP-019, precision balance
Precision Balances[3]	Up to 500 g 501 g to 35 kg	0.6*R* + 0.000 14 % 0.6*R* + 0.01 %	CP-002, ultra class weights
Platform Scales[3]	Up to 50 lb (51 to 500) lb (501 to 5000) lb	0.6*R* + 0.01 %	CP-002, Class F weights
Indirect Verification of Micro Hardness – Knoop[3]	(250 to 650) HK > 650 HK	15 HK 20 HK	CP-004, blocks
Indirect Verification of Micro Hardness – Vickers[3]	(100 to 600) HV (> 600 to 1100) HV	25 HV 19 HV	CP-004, blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Verification of Brinell Hardness Testers[3]	HBW (126 to 758)	7.5 HBW	CP-014 Brinell hardness blocks
Indirect Verification of Rockwell Hardness Testers[3]	HRC: Low Medium High HRA: Low Medium High HRBW: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High HR15T: Low Medium High HR30T: Low Medium High HR45T: Low Medium High	 0.54 HRC 0.48 HRC 0.48 HRC 0.26 HRA 0.24 HRA 0.20 HRA 0.36 HRBW 0.37 HRBW 0.44 HRBW 0.47 HR15N 0.29 HR15N 0.30 HR15N 0.46 HR30N 0.44 HR30N 0.32 HR30N 0.50 HR45N 0.23 HR45N 0.24 HR45N 0.46 HR15T 0.40 HR15T 0.38 HR15T 0.58 HR30T 0.39 HR30T 0.40 HR30T 0.64 HR45T 0.64 HR45T 0.46 HR45T	CP-004, indirect method (ASTM E18) standard hardness test blocks

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Durometer –			
Type A, B, O[3]	Up to 100 Points (56.08 to 820.87) g	4.7 grams	CP-017, electronic balance, gage blocks, optical inspection under magnification
Type C, D, DO[3]	Up to 100 Points Up to 4.53 kg	26 grams	
Indenter Display	(0.096 to 0.100) in	0.032 in	
Force – Compression[3] Measure & Measuring Equipment	Up to 2000 lbf (2000 to 10 000) lbf (10 000 to 50 000) lbf (50 000 to 100 000) lbf (100 000 to 600 000) lbf (600 000 to 1 000 000) lbf	0.19 % 0.19 % 0.19 % 0.19 % 0.2 % 0.45 %	CP-001, gram force gages, dead weights ASTM E4 method using load cells & dead weights
Force – Tension[3] Measure & Measuring Equipment	Up to 200 000 lbf	0.2 %	CP-001, ASTM E4 method using load cells & dead weights
Force Measure & Measuring Equipment (ISO 7500-1) – Compression[3]	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.09 % 0.11 % 0.11 %	CP-140, Class .05 load cells
Force Measure & Measuring Equipment (ISO 7500-1) – Tension[3]	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.12 % 0.07 % 0.07 %	CP-140, Class .05 load cells
Force Stress Rupture (ISO 7500-2) – Tension[3]	Up to 3000) lbf (3000 to 30 000) lbf (30 000 to 120 000) lbf	0.12 % 0.07 % 0.07 %	CP-141, Class .05 load cells
Force, Dynamic – Measure[3]	Up to 30 000 lbf	0.77 %	CP-001 (ASTM E-467) Dynamic force transducer

Parameter/Equipment	Range	CMC[2, 7, 9] (±)	Comments
Torque – Measure[3]	(0 to 50) lbf·in (> 50 to 750) lbf·in (25 to 250) lbf·ft (> 250 to 1000) lbf·ft	0.55 % 0.55 % 0.56 % 0.59 %	CP-006, torque transducer
Pressure[3] –			
Hydraulic	(10 to 10 000) psi	0.016 % 0.037 %	CP-003, hydraulic dead weight tester
Pneumatic	Up to 200 in·H_2O Up to 2000 in·H_2O	0.013 %	Pneumatic digital pressure indicator using digital pressure gauge
Vacuum – Measure[3]	Up to 30 in·Hg	0.03 %	CP-003, vacuum gage, digital gage
Rotational Speed – Measure[3]	(5 to 99 999) RPM	0.061 RPM + 0.058 %	Digital Tachometer

VIII. Thermodynamics

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Humidity – Measure[3]	(20 to 75) % RH (75 to 95) % RH	1.5 % RH 1.9 % RH	CP-012, digital hygrometer thermometer
Thermal Ovens, Freezers, Environmental Chambers, Autoclaves, Water Baths, & Sealers[3]	(-100 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 400) °C (400 to 600) °C	0.3 °C 0.11 °C 0.14 °C 0.16 °C 0.17 °C	CP-011, thermocouple/RTD meters
Thermometers[3]	(-40 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 400) °C (400 to 600) °C	0.062 °C 0.028 °C 0.043 °C 0.050 °C 0.066 °C	CP-012, thermocouple/RTD meters

Parameter/Equipment	Range	CMC[2] (±)	Comments
IR Thermometers/ Pyrometers[3]	(50 to 500) °C	5.3 °C	CP-012, black body, PRT, reference pyrometer λ = (8 to 14) µm, where ε = 0.95

IX. Time & Frequency

Parameter/Equipment	Range	CMC[2, 9] (±)	Comments
Frequency – Measure[3]	0.33 ns to 10 s 1 Hz to 250 MHz	520 ns 0.24 µHz/Hz	Universal counter
Frequency – Measurement Equipment[3]	0.01 Hz to 600 MHz	29 µHz/Hz + 17 mHz	Multifunction calibrator, scope calibrator
Stopwatches, Timers[3]	Up to 10 Hr	34 ms	Stopwatch
Time Verification[3]	24 Hr	0.06 s/d	Vibrograf TM-4500
Non-contact RPM[3]– Measuring Equipment	Up to 7200 RPM (7200 to 72 000) RPM (72 000 to 99 999) RPM	0.0028 % + 0.07 RPM 0.001 % + 0.2 RPM 0.0003 % to 1 RPM	Fluke 5500A, HP 53132A

[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] Dimensional Inspection refers to the measurement and verification of Sieves, liquid limit devices, grooving tools, followers, plunger, metal specimens, Kelly ball, LA Abrasion, Marshall and proctor hammers, platens, expansion racks, slump cones, tampers, 123 blocks, and sample splitters

[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] In the statement of CMC, SG is the numerical value of the specific gravity, *R* is the resolution of the unit under test, *DL* is the diagonal length of the device measured in inches, and *L* is the numerical value of the nominal length of the device measured in inches.

[7] In the statement of CMC, percentages are percentages of reading unless otherwise noted.

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

[9] 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

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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 4th day of November 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4986.01
Valid to November 30, 2028

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