SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

ASSOCIATED CALIBRATION, INC. DBA A-CAL
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CALIBRATION

Valid To: January 31, 2019 Certificate Number: 4986.02

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

I. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Calipers[3] –	0.001 in Resolution:		
	Up to 4 in	1000 µin	Gage blocks and end standards
	Up to 6 in	1200 µin	
	Up to 8 in	1500 µin	
	Up to 12 in	1600 µin	
	Up to 18 in	1800 µin	
	Up to 24 in	1200 µin	
	Up to 36 in	2000 µin	
	Up to 40 in	2200 µin	
	Up to 60 in	2500 µin	
	0.0005 in Resolution:		
	Up to 4 in	400 µin	
	Up to 6 in	500 µin	
	Up to 8 in	400 µin	
	Up to 12 in	700 µin	
	Up to 18 in	1000 µin	
	Up to 24 in	1200 µin	
	Up to 40 in	1400 µin	
	Up to 60 in	1800 µin	

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Parameter/Equipment	Range	CMC[2] (±)	Comments
Micrometers – External[3]	0.001 in Resolution: Up to 2 in (2 to 4) in (4 to 6) in (6 to 8) in (8 to 12) in 0.0001 in Resolution: Up to 2 in (2 to 4) in (4 to 6) in (6 to 8) in (8 to 12) in 0.000 05 in Resolution: Up to 1 in	 1000 µin 1300 µin 1500 µin 1600 µin 2000 µin 100 µin 120 µin 140 µin 170 µin 190 µin 40 µin	Gage blocks
Dial Indicator – Mechanical/Electronic[3]	0.0005 in Resolution: Up to 1 in Up to 2 in 0.0001 in Resolution: Up to 1 in Up to 2 in 0.000 05 in Resolution: Up to 1 in Up to 2 in	 700 µin 800 µin 100 µin 140 µin 70 µin 80 µin	Gage blocks
Strain Instruments and Recorders[3]	Up to 2 in	110 µin	Tinius Olsen CAL 60 calibrator
Depth Gage[3]	Up to 8 in	1500 µin	Gage blocks
Ring Gage	Up to 6 in	80 µin	Federal in. comparator with gage blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Plug Gages	Up to 1 in (>1 to 2) in (>2 to 4) in	0.000 05 in 0.000 07 in 0.0001 in	Gage blocks and comparator
Thread Plug Gage	Up to 1 in	500 µin	Three-wire set and MU-checker
End Standards	Up to 6 in (>6 to 12) in (>12 to 24) in (>24 to 36) in	25 µin 100 µin 170 µin 280 µin	Height master, riser blocks, gage blocks, and electronic pick-up
Height Gages[3]	0.001 in Resolution: Up to 12 in Up to 24 in 0.0001 in Resolution: Up to 12 in Up to 24 in	 1600 µin 1900 µin 170 µin 280 µin	End standards and electronic pick-up with µ-checker
Riser Blocks	Up to 12 in	80 µin	Gage blocks and µ-checker
Microscope[3]	X to Y Range: (6 x 4) in 0.0001 in Resolution X to Y Range: (6 x 4) in 0.0005 in Resolution	 180 µin 800 µin	Gage blocks and image reticles
Super Micrometer™, [3]	Up to 1 in	80 µin	Gage blocks
Bevel Protractor	(0 to 340)°	1 min of arc	Angle gage blocks

II. Dimensional Inspection

Parameter/Equipment	Range	CMC[2] (±)	Comments
1 – Dimensional Inspection[3, 4]	Up to 12 in	600 µin	CP-115, ASTM and AASHTO procedures, calipers, rulers, straight edges, and gage blocks

III. 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	0.25 % + 0.15 µA 0.13 % + 0.15 µA 0.13 % + 0.25 µA 0.4 % + 0.15 µA 1.3 % + 0.15 µA	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	0.2 % + 0.3 µA 0.1 % + 0.3 µA 0.1 % + 0.3 µA 0.2 % + 0.3 µA 0.6 % + 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	0.2 % + 3 µA 0.1 % + 3 µA 0.09 % + 3 µA 0.2 % + 3 µA 0.6 % + 3 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	0.2 % to 30 µA 0.1 % + 30 µA 0.09 % + 30 µA 0.2 % + 30 µA 0.6 % + 30 µA	
(0.33 to 2.199 99) A	(10 to 20) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.2 % + 300 µA 0.1 % + 300 µA 0.75 % + 300 µA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.06 % + 2000 µA 0.10 % + 2000 µA 0.33 % + 2000 µA	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current – Measure[3]			
(0 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.031 % + 0.01 % rng 0.03 % + 0.01 % rng 0.07 % + 0.01 % rng 0.4 % + 0.01 % rng	Fluke 8508A
(>20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.031 % + 0.01 % rng 0.029 % + 0.01 % rng 0.063 % + 0.01 % rng	
>200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.062 % + 0.01 % rng 0.073 % + 0.01 % rng 0.3 % + 0.01 % rng	
(>2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.082 % + 0.01 % rng 0.25 % + 0.01 % rng	
(0 to 2500) A	60 Hz	0.5 % rdg	Current shunt and 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	0.35 % + 20 µA 0.15 % + 20 µA 0.2 % + 20 µA 0.25 % + 20 µA 0.35 % + 33 µA 1 % + 60 µA	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	0.25 % + 50 µA 0.05 % + 20 µA 0.1 % + 20 µA 0.16 % + 40 µA 0.24 % + 170 µA 0.7 % + 330 µA	
(0.33 to 3.29999) 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	0.15 % + 250 µA 0.03 % + 60 µA 0.08 % + 60 µA 0.14 % + 300 µA 0.24 % + 1700 µA 0.5 % + 3300 µA	

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	0.15 % + 2500 µA 0.04 % + 600 µA 0.08 % + 2600 µA 0.19 % + 5000 µA 0.24 % + 17 000 µA	Multifunction calibrator
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.05 % + 6.6 mV 0.08 % + 15 mV 0.09 % + 33 mV	
(330 to 1020 V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.05 % + 80 mV 0.20 % + 100 mV 0.20 % + 500 mV	
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	0.017 % + 70 µA 0.014 % + 20 µA 0.012 % + 20 µA 0.011 % + 10 µA 0.014 % + 20 µA 0.034 % + 40 µA 0.077 % + 100 µA	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	0.015 % + 60 µA 0.012 % + 10 µA 0.009 % + 10 µA 0.0075 % + 10 µA 0.011 % + 10 µA 0.022 % + 20 µA 0.057 % + 100 µA 0.3 % + 0.1 % rng 1 % + 1 % rng	
(>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	0.015 % + 70 µA 0.012 % + 20 µA 0.012 % + 20 µA 0.023 % + 40 µA 0.058 % + 200 µA	
(>1 to 20) kV	(20 to 100) Hz	0.4 % rdg + 40 V	Precision HV meter

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Capacitance – Generate[3]	Up to 1 nF Up to 1 µF	0.1 % + 1 DIV 0.5 %	Standard capacitor Decade capacitor
(50 to 1000) Hz	(1.0 to 1.0999) µF (1.1 to 3.2999) µF	(0.25 % + 1 nF) @ 5 kHz (0.35 % + 3 nF) @ 2 kHz	Multifunction calibrator
(50 to 400) Hz	(3.3 to 10.999) µF (11 to 32.999) µF	(0.35 % + 10 nF) @ 1.5 kHz (0.40 % + 30 nF) @ 800 Hz	
(50 to 200) Hz	(33 to 109.99) µF	(0.50 % + 100 nF) @ 400 Hz	
(50 to 100) Hz	(110 to 329.99) µF (330 to 1.1) mF	(0.70 % + 300 nF) @ 200 Hz (1 % + 300 nF) @ 150 Hz	
DC Current – Generate[3]	0 to 3.299 99) mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 2.19999 A (2.2 to 11) A	0.013 % + 0.05 µA 0.01 % + 0.25 µA 0.01 % + 3.3 µA 0.03 % + 44 µA 0.06 % + 330 µA	Multifunction calibrator
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	12 % + 2.0 µA 14 % + 2.0 µA 48 % + 4.0 µA 190 % + 8.0 µA 400 % + 20 µA 0.57 % rdg	Fluke 8508A Current shunt and 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	0.006 % + 3 µV 0.005 % + 5 µV 0.005 % + 50 µV 0.0055 % + 500 µV 0.0055 % + 1500 µV	Multifunction calibrator
DC Voltage – Measure[3]	(0 to 200) mV >200 mV to 20 V (>20 to 200) V (>200 to 1000) V (>1000 to 2000) V (>2 to 20) kV	0.0005 % + 0.00055 % rng 0.00035 % + 0.0002 % rng 0.0035 % + 0.0002 % rng 0.00055 + 0.0005 % rng 0.04 % rdg + 0.4 V 0.04 % rdg + 4 V	Multifunction calibrator Precision HV meter

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
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 3.29999) kΩ (3.3 to 10.9999) kΩ (11 to 32.9999) 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 1 Ω 10 Ω 1000 Ω 10 000 Ω	0.012 % + 0.008 Ω 0.012 % + 0.015 Ω 0.009 % + 0.015 Ω 0.009 % + 0.015 Ω 0.009 % + 0.06 Ω 0.009 % + 0.06 Ω 0.009 % + 0.6 Ω 0.009 % + 0.6 Ω 0.012 % + 6 Ω 0.015 % + 55 Ω 0.015 % + 55 Ω 0.06 % + 550 Ω 0.1 % + 550 Ω 0.5 % + 5.5 kΩ 0.5 % + 17 kΩ 24 µΩ 16 µΩ 10 µΩ 25 µΩ	Multifunction calibrator Standard resistor
Resistance – Measure[3]	(0 to 2) Ω (>2 to 20) Ω >20 Ω to 200 kΩ >200 kΩ to 2 MΩ (>2 to 20) MΩ (>20 to 200) MΩ >200 MΩ to 2 GΩ	0.0017 % + 0.0002 % rng 0.000 95 % + 0.00007 % rng 0.0008 % + 0.000025 % rng 0.0009 % + 0.00005 % rng 0.002 % + 0.005 % rng 0.012 % + 0.005 % rng 0.15 % + 0.05 % rng	Fluke 8508A
Inductance – Generate[3] (1 kHz nominal)	100 µH (1, 10, and 100) mH (1 and 10) H	0.25 % 0.1 % 0.1 %	Standard inductors

IV. Fluid Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Rotational Viscometers[3]	(0 to 2500) Mpa (2500 to 10 000) Mpa (10 000 to 150 000) Mpa	0.62 Mpa 68 Mpa 1200 Mpa	Certified viscosity reference standards

V. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Test Machine Alignment[3]	Up to 30,000 lbf Axial Load	0.6 % bending	ASTM E1012 strain recorder and strain gauge bars
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 Up to 230 g (230 to 1200) g (1200 to 3400) g	150 mg 15 mg 10 mg 0.08 mg 0.06 mg 0.04 mg 0.025 mg 0.025 mg 0.008 mg 0.008 mg 0.008 mg 0.008 mg 0.004 mg 0.004 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.002 mg 0.000 13 lb 0.06 mg 0.96 mg 0.075 g	Sartorious electrical analytical balance
Force – Compression[3]	(100 to 1000) gf (2 to 20) lbf (>20 to 5000) lbf (>5,000 to 6000) lbf (>6,000 to 20 000) lbf (>20,000 to 200 000) lbf (297 to 3000) lbf (>3000 to 6000) lbf (>6000 to 30 000) lbf (>30 000 to 120 000) lbf (>120000 to 300 000) lbf (>300 000 to 600 000) lbf	0.04 % rdg 0.04 % rdg 0.04 % rdg 0.04 % rdg 0.05 % rdg 0.06 % rdg 0.03 % rdg 0.03 % rdg 0.03 % rdg 0.04 % rdg 0.05 % rdg 110 lbf	Gram force gages ASTM E4 method to using proving rings ASTM E4 method to using proving rings ASTM E4 method using load cells and readout

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Force – Tension[3]	(62 to 500) lbf (>500 to 3000) lbf (>3000 to 5000) lbf (>5000 to 20 000) lbf (>20 000 to 30 000) lbf (>30 000 to 120 000) lbf	0.03 % of rdg 0.03 % of rdg 0.04 % of rdg 0.05 % of rdg 0.05 % of rdg 0.06 % of rdg	ASTM E4 using proving rings
Indirect Validation of Hardness Testers[3]	HRC: Low Medium High HRA: Low Medium High HRBW: Low Medium High HRBS: Low Medium High HR15N: Low Medium High HR30N: Low Medium High HR45N: Low Medium High HR15T: Low Medium High	 0.4 HRC 0.4 HRC 0.4 HRC 1.0 HRA 1.0 HRA 1.0 HRA 0.9 HRBW 0.9 HRBW 0.9 HRBW 0.9 HRBS 0.9 HRBS 0.9 HRBS 1.1 HR15N 1.1 HR15N 1.1 HR15N 1.1 HR30N 1.1 HR30N 1.1 HR30N 1.1 HR45N 1.1 HR45N 1.1 HR45N 1.1 HR15T 1.1 HR15T 1.1 HR15T	Indirect method (ASTM E18) sun tech standard hardness test blocks

Parameter/Equipment	Range	CMC[2] (±)	Comments
Indirect Validation of Hardness Testers[3] (cont)	HR30T: Low Medium High HR45T: Low Medium High	 1.1 HR30T 1.1 HR30T 1.1 HR30T 1.1 HR45T 1.1 HR45T 1.1 HR45T	Indirect method (ASTM E18) sun tech standard hardness test blocks
Durometer – Type A, B, O[3]	Up to 100 Points (56.08 to 820.87) g	2 Points	Sartorious electronic balance
Durometer – Type C, D, DO[3]	Up to 100 Points 0 g to 4.53 kg	2 Points	Sartorious electronic balance
Durometer – Indentor Calibration[3]	(0.096 to 0.100) in	0.000 33 in	Mitutoyo digital caliper
Precision Balances and Single Pan Balances[3]	Up to 500 g (501 to 1000) g 1001 g to 35 kg	0.05 mg 0.2 mg 2.5 mg	Sartorious ultra class weights using conversion factor of 1 lb = 453.59237 grams or 1 gram = 0.0022046 lbs
Precision Balances[3]	Up to 6.1 kg	100 g	Platform scale
Platform Scales[3]	Up to 50 lb (51 to 500) lb (501 to 2000) lb	0.000 006 lb 0.007 lb 0.03 lb	Rice Lake Class F weights
Pressure[3]	0.1 psi to 10 000 psi Up to 5000 psi Up to 120 in·Hg Up to 200 in·H2O (200 to 800) in·H2O Up to 2000 in·H2O	0.01 % of rdg 0.3 % of rdg 0.1 % of rdg 0.1 % of rdg 0.1 % of rdg 0.1 % of rdg	Hydraulic dead weight tester Pneumatic digital pressure indicator Using digital pressure gauge
Vacuum – Measure[3]	Up to 30 in·Hg (30 to 120) in·Hg	<0.003 in·Hg 0.1 psig	Vacuum gage Digital gage

Parameter/Equipment	Range	CMC[2] (±)	Comments
Torque – Measure[3]	(4 to 50) lb·in (>50 to 400) lb·in (>400 to 1000) lb·in (20 to 250) lb·ft (>250 to 2000) lb·ft	0.25 % rdg 0.45 % rdg 0.45 % rdg 0.45 % rdg 0.75 % rdg	Torque transducer, 10 to 100 % of range Torque wrench

V. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Humidity – Measure[3]	(10.00 to 95.00) % RH (-70 to 180) °C	0.87 % RH	Digital hygrometer thermometer
Thermocouples and Thermocouple Indicators[3]			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	5500A multifunction calibrator
Type C	Up to 150 °C (150 to 650) °C (50 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.3 °C 0.26 °C 0.31 °C 0.5 °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	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thermocouples and Thermocouple Indicators[3] (cont)			
Type K	(-210 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	5500A multifunction calibrator
Type L	(-200 to -100) °C (-100 to 800) °C	0.37 °C 0.26 °C	
Type N	(800 to 900) °C (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.17 °C 0.4 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	Up to 250 °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	Up to 250 °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T	(-250 to -150) °C (-150 to 0) °C Up to 120 °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	
Type U	(-200 to 0) °C Up to 600 °C	0.56 °C 0.27 °C	
Calibration of RTD – Generate[3]			
Pt 385, 100 Ω	(-200 to 0) °C Up to 100 °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C	5500A multifunction calibrator

Parameter/Equipment	Range	CMC[2] (±)	Comments
Calibration of RTD – Generate[3] (cont)			
Pt 3926, 100 Ω	(-200 to 0) °C Up to 100 °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C	5500A multifunction calibrator
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C Up 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 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C	
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C	
Pt 385, 1000 Ω	(-200 to 0) °C Up to 100 °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.23 °C	
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.08 °C 0.14 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thermal Ovens, Freezers, Environmental Chambers, Autoclaves, Water Baths, and Sealers[3]	(-200 to 600) °C	1.2 °C	CP-011, thermocouple/RTD meters
Thermometers, Digital – Generate[3]	(-200 to 600) °C	1.2 °C	CP-012, thermocouple/RTD meters
Temperature Resistance – Measure[3]	Up to 200 Ω 200 Ω to 2 kΩ	0.00075 % rdg + 0.000014 rng 0.00075 % rdg + 0.00005 rng	Fluke 8508A (25 and 100 Ω RTD/SPRT)
Conductivity – Generate[3]	29.92 PIACS 44.70 PIACS 58.93 PIACS	1 % rdg 0.35 PIACS 0.35 PIACS	Conductivity standards

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2] (±)	Comments
Frequency – Measure[3]	(0 to 3) GHz	$3x10^{-7}$ Hz	Universal counter
Frequency – Source[3]	0.01 Hz to 10 kHz >10 kHz to 2 MHz 5 s to 2 ns 50 kHz to 600 MHz	0.0025 % rdg 0.0025 % rdg 0.5 % rdg 1.5 % rdg	Multifunction calibrator Scope calibrator
Time Verification[3]	(0 to 10) Hr	0.043 % rdg	Stopwatch
Stopwatches, Timers[3]	24 Hr	0.0086 s	Vibrograf TM-4500

[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 and this laboratory meets A2LA *R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] Dimensional Inspection covers sieves, liquid limit device, grooving tool, 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. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

Accredited Laboratory

A2LA has accredited

ASSOCIATED CALIBRATION, INC. DBA A-CAL

Anaheim, CA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets *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 May 2018.

President and CEO
For the Accreditation Council
Certificate Number 4986.02
Valid to January 31, 2019
Revised November 19, 2018

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