



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

APPLIED TECHNICAL SERVICES, INC.
8400 Wolf Lake Dr. Suite 106
Memphis, TN 38133
James Halsey Phone: 770 423 1400
jhalsey@atslab.com

CALIBRATION

Valid To: March 31, 2020

Certificate Number: 1888.05

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional inspections¹:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH Measuring Equipment ³	(4.01, 7.0, 10.0) pH units	0.034 pH units	pH buffer solutions
Conductivity ³ – Liquid	(0 to 10) µS (>10 to 100) µS (>100 to 1413) µS (>1413 to 10 000) µS	0.68 µS 0.57 µS 6.0 µS 54 µS	Conductivity solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Calipers ³	Up to 80 in	(170 + 12L) μ in	Gage blocks
Micrometers ³	Up to 6 in (6 to 80) in	(20 + 10L) μ in (55 + 13L) μ in	Gage blocks
Height Gages ³	Up to 80 in	(120 + 8L) μ in	Gage blocks
Bore Micrometers and Countersink Gages ³	Up to 4 in	(70 + 20L) μ in	Ring gages
Dial, Digital, Test, Bore & Co-Axial Indicators ³	Up to 4 in	(25 + 6L) μ in	Gage blocks
Rigid Rulers ³	Up to 80 in	0.010 in	Gage blocks
Tape Measures	Up to 100 ft	0.014 in per 6 foot	Master rule
Cylindricals – OD Pins, Plugs, Master Disc Outside Diameter ³	Up to 10 in	41 μ in	P&W Supermicrometer TM
Thread Gages – ³ Pitch Diameter Major Diameter	(4 to 80) TPI Up to 10 in	100 μ in 41 μ in	P&W Supermicrometer TM w/Thread Wires P&W Supermicrometer TM
Micrometer Standards ³	Up to 10 in	(33 + 8L) μ in	P&W Supermicrometer TM

Parameter/Equipment	Range	CMC ^{2, 4, 6} (\pm)	Comments
Feeler Gages ³	Up to 1 in	70 μ in	P&W Supermicrometer TM
Surface Plate ³ – Flatness	12 in \times 12 in to 12 ft \times 12 ft	(20 + 2 <i>DL</i>) μ in	Electronic level system <i>DL</i> =diagonal distance
Repeat Reading	12 in \times 12 in to 12 ft \times 12 ft	34 μ in	Repeat-o-meter
Optical Comparator and Vision Machines ³ X-Y Linearity	Up to 6 in	250 μ in + 0.60 <i>R</i>	Glass master
Crimp Tools ³	Go/No Go Crimp Height	600 μ in 0.001 in	Pin gages Crimp micrometer
Protractors ³	0° to 360°	0.033° + 0.6 <i>R</i>	Angle blocks

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	21 μ V/V + 1.0 μ V 12 μ V/V + 2.0 μ V 13 μ V/V + 20 μ V 19 μ V/V + 150 μ V 19 μ V/V + 1.5 mV	Fluke 5522A



Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments
DC Voltage – Measure ³	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	10 μ V/V + 3.0 μ V 9 μ V/V + 3.0 μ V 9 μ V/V + 5.0 μ V 11 μ V/V + 30 μ V 11 μ V/V + 100 μ V	Agilent 3458A
	(1 to 9) kV	0.036 %	Vitretek 4700
	(9 to 90) kV	0.67 %	Vitretek 4700 with HVL-4700
	(90 to 175) kV	1.1 %	KVM 200 Divider
DC Current – Generate ³	Up to 330 μ A (330 μ A to 3.3 mA) (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3.0) A (3.0 to 11) A (11 to 20.5) A	0.016 % + 0.020 μ A 0.011 % + 0.030 μ A 0.011 % + 0.20 μ A 0.011 % + 2.5 μ A 0.021 % + 40 μ A 0.039 % + 40 μ A 0.051 % + 500 μ A 0.10 % + 750 μ A	Fluke 5522A
	Clamp-on only (20.5 to 1025) A	0.50 % + 0.50 A	Fluke 5520A/coil
DC Current – Measure ³	(10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 3) A 3 A to 2 kA (2 to 10) kA	22 μ A/A + 1.0 nA 22 μ A/A + 5.0 nA 22 μ A/A + 50 nA 37 μ A/A + 0.50 nA 0.012 % + 10 μ A 0.13 % + 0.60 mA 0.25 % 1.0 %	Agilent 3458A Agilent 34401A Empro shunts



Parameter/Equipment	Range	CMC ^{2, 5, 6} (\pm)	Comments
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 k Ω (1.1 to 11) k Ω (11 to 110) k Ω 110 k to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω (1 to 10) G Ω (10 to 100) G Ω	40 $\mu\Omega/\Omega$ + 1.0 m Ω 30 $\mu\Omega/\Omega$ + 1.5 m Ω 28 $\mu\Omega/\Omega$ + 1.4 m Ω 28 $\mu\Omega/\Omega$ + 2.0 m Ω 28 $\mu\Omega/\Omega$ + 20 m Ω 28 $\mu\Omega/\Omega$ + 0.20 Ω 32 $\mu\Omega/\Omega$ + 2.0 Ω 60 $\mu\Omega/\Omega$ + 30 m Ω 0.013 % + 50 Ω 0.025 % + 2.5 k Ω 0.05 % + 3.0 k Ω 0.30 % + 100 k Ω 1.5 % + 500 k Ω 0.51 % 1.1 %	Fluke 5522A Biddle 72-6345-4 Biddle 72-6345-4
Fixed Points ³	1.0 m Ω 10.0 m Ω 100.0 m Ω 1 Ω	50 $\mu\Omega/\Omega$ 50 $\mu\Omega/\Omega$ 50 $\mu\Omega/\Omega$ 50 $\mu\Omega/\Omega$	L&N resistor L&N resistor L&N resistor L&N resistor
Resistance – Measure ³	(0 to 10) Ω (10 to 100) Ω (100 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	20 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 0.50 m Ω 13 $\mu\Omega/\Omega$ + 1.1 m Ω 18 $\mu\Omega/\Omega$ + 2.0 Ω 50 $\mu\Omega/\Omega$ + 100 Ω 0.060 % + 1.0 k Ω 0.50 % + 10 k Ω	Agilent 3458A
Capacitance – Generate ³	(0.19 to 3.3) nF (3.3 to 330) nF 330 nF to 3.3 μ F (3.3 to 33) μ F (33 to 330) μ F 330 μ F to 3.3 mF (3.3 to 33) mF (33 to 110) mF	0.50 % + 0.01 nF 0.25 % + 0.30 nF 0.20 % + 3.0 nF 0.40 % + 30 nF 0.45 % + 300 nF 0.45 % + 3.0 μ F 0.75 % + 30 μ F 0.66 % + 100 μ F	Fluke 5522A

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments	
Capacitance – Generate Fixed Points ³	(0.001, 0.01, 0.1) μF	0.16 %	GR 1409 series	
	1 μF (0 to 1.1) μF	0.070 %	Quad Tech 1413	
Capacitance – Measure ³ at 1 kHz	(0 to 1120) μF	0.27 %	GR 1689	
Inductance – Generate ³ at 1 kHz	1 mH	0.42 %	GR 1482-E	
	10.0 mH	0.12 %	GR1482-H	
	100 mH	0.12 %	GR1482-L	
Inductance – Measure ³	1 μH to 100 H	0.27 %	GR 1689	
Electrical Calibration of Thermocouple Indicators ³ –	Type B	600 °C to 800 °C	0.49 °C	Fluke 5522A
		800 °C to 1000 °C	0.40 °C	
		1000 °C to 1550 °C	0.36 °C	
		1550 °C to 1800 °C	0.31 °C	
	Type C	0 °C to 150 °C	0.28 °C	
		150 °C to 650 °C	0.23 °C	
		650 °C to 1000 °C	0.28 °C	
		1000 °C to 1800 °C	0.45 °C	
		1800 °C to 2316 °C	0.73 °C	
	Type E	-250 °C to -100 °C	0.05 °C	
		-100 °C to -25 °C	0.15 °C	
		-25 °C to 350 °C	0.13 °C	
		350 °C to 650 °C	0.16 °C	
		650 °C to 1000 °C	0.20 °C	



Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators ³ – (cont)			
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.32 °C 0.15 °C 0.13 °C 0.17 °C 0.22 °C	Fluke 5522A
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.30 °C 0.17 °C 0.15 °C 0.23 °C 0.35 °C	
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.43 °C 0.31 °C 0.20 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.36 °C 0.20 °C 0.18 °C 0.17 °C 0.25 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.56 °C 0.33 °C 0.31 °C 0.36 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.55 °C 0.35 °C 0.33 °C 0.40 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.56 °C 0.22 °C 0.15 °C 0.13 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.65 °C 0.32 °C	



Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTDs ³ –			
Pt 385, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 630 °C 630 °C to 800 °C	0.063 °C 0.083 °C 0.10 °C 0.12 °C 0.25 °C	Fluke 5522A
Pt 3926, 100 Ω	-200 °C to 0 °C 0 °C to 300 °C 300 °C to 630 °C	0.06 °C 0.10 °C 0.12 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to 0 °C 0 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.29 °C 0.07 °C 0.08 °C 0.10 °C 0.27 °C	
Pt 385, 200 Ω	-200 °C to 260 °C 260 °C to 630 °C	0.060 °C 0.17 °C	
Pt 385, 500 Ω	-200 °C to 260 °C 260 °C to 400 °C 400 °C to 630 °C	0.060 °C 0.090 °C 0.11 °C	
Pt 385, 1000 Ω	-200 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.050 °C 0.080 °C 0.26 °C	
Ni 120, 120 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.090 °C 0.16 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.35 °C	



Parameter/Range	Frequency	CMC ^{2, 5, 6} (\pm)	Comments
AC Voltage – Generate ³			
(1 to 33) 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	0.080 % + 6.0 μ V 0.015 % + 6.0 μ V 0.02 % + 6.0 μ V 0.10 % + 6.0 μ V 0.36 % + 12 μ V 0.80 % + 50 μ V	Fluke 5522A
(33 to 330) 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	0.030 % + 8.0 μ V 0.015 % + 8.0 μ V 0.016 % + 8.0 μ V 0.035 % + 8.0 μ V 0.080 % + 32 μ V 0.20 % + 70 μ V	
(0.33 to 3.3) 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	0.030 % + 50 μ V 0.015 % + 60 μ V 0.019 % + 60 μ V 0.030 % + 50 μ V 0.070 % + 130 μ V 0.24 % + 600 μ V	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.030 % + 650 μ V 0.015 % + 600 μ V 0.024 % + 600 μ V 0.035 % + 600 μ V 0.090 % + 1.6 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.019 % + 2.0 mV 0.020 % + 6.0 mV 0.025 % + 6.0 mV 0.030 % + 6.0 mV 0.20 % + 6.0 mV	
(330 to 1020) V	45 Hz to 10 kHz	0.030 % + 10 mV	



Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Voltage – Measure ³			
(1 to 10) mV	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.031 % rdg + 0.030 % rng 0.021 % rdg + 0.010 % rng 0.031 % rdg + 0.010 % rng 0.011 % rdg + 0.010 % rng 0.51 % rdg + 0.010 % rng 4.1 % rdg + 0.020 % rng	Agilent 3458A
(10 to 100) mV, 100 mV to 1 V, (1 to 10) V	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.0080 % rdg + 0.0050 % rng 0.0080 % rdg + 0.0020 % rng 0.015 % rdg + 0.0020 % rng 0.031 % rdg + 0.0020 % rng 0.081 % rdg + 0.0020 % rng 0.031 % rdg + 0.010 % rng 2.0 % rdg + 0.010 % rng 2.0 % rdg + 0.010 % rng	
(10 to 100) V	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.021 % rdg + 0.0040 % rng 0.021 % rdg + 0.0020 % rng 0.021 % rdg + 0.0020 % rng 0.036 % rdg + 0.0020 % rng 0.13 % rdg + 0.0020 % rng 0.41 % rdg + 0.013 % rng 1.8 % rdg + 0.010 % rng	
(100 to 750) V	(10 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.041 % rdg + 0.0040 % rng 0.041 % rdg + 0.0020 % rng 0.061 % rdg + 0.0020 % rng 0.13 % rdg + 0.0020 % rng 0.31 % rdg + 0.0020 % rng	
750 V to 9 kV	(50 to 60) Hz	0.45 %	Vitrek 4700
(9 to 70) kV	(50 to 60) Hz	1.5 %	Vitrek 4700 with HVL-4700
(70 to 100) kV	60 Hz	1.5%	KVM 200 divider



Parameter/Range	Frequency	CMC ^{2,6} (\pm)	Comments
AC Current – Generate ³			
(29 to 330) μ A	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.03 % rdg + 6.0 μ A 0.15 % rdg + 1.0 μ A 0.13 % rdg + 0.1 μ A 0.3 % rdg + 0.20 μ A 0.8 % rdg + 0.10 μ A 1.6 % rdg + 0.50 μ A	Fluke 5522A
330 μ A to 3.3 mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 30) kHz	0.20 % rdg + 17 μ A 0.14 % rdg + 16 μ A 0.11 % rdg + 15 μ A 0.20 % rdg + 0.30 μ A 0.90 % rdg + 0.60 μ A	
(3.3 to 33) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.20 % rdg + 5.0 μ A 0.20 % rdg + 15 μ A 0.12 % rdg + 15 μ A 0.08 % rdg + 2.0 μ A 0.19 % rdg + 3.0 μ A 1.0 % rdg + 6.0 μ A	
(33 to 330) mA	(10 to 20) Hz (20 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.18 % rdg + 20 μ A 0.50 % rdg + 50 μ A 0.050 % rdg + 5.0 μ A 0.10 % rdg + 50 μ A 0.15 % rdg + 75 μ A 0.40 % rdg + 500 μ A	
330 mA to 1.1 A	(10 to 45) Hz (0.45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.19 % rdg + 300 μ A 0.050 % rdg + 200 μ A 0.10 % rdg + 500 μ A 3.0 % rdg + 2.0 mA	
(1.1 to 3) A	(10 to 45) Hz (0.45 to 1) kHz (1 to 10) kHz	0.18 % rdg + 100 μ A 0.80 % rdg + 600 μ A 0.80 % rdg + 1.0 mA	
(3 to 11) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	1.8 % rdg + 5.0 mA 2.5 % rdg + 5.0 mA 3.0 % rdg + 5.0 mA	
(11 to 20.5) A	(45 to 100) Hz (0.1 to 5) kHz	1.0 % rdg + 500 mA 2.5 % rdg + 500 mA	

Parameter/Range	Frequency	CMC ^{2, 5, 6} (±)	Comments
AC Current – Generate ³ (cont) Clamp-on only (20.5 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.80 % 0.99 %	Fluke 5522A w/Fluke 50-turn coil
AC Current – Measure ³ (5 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	0.45 % rdg + 0.030 % rng 0.18 % rdg + 0.030 % rng 0.80 % rdg + 0.030 % rng	Agilent 3458A
AC Current – Measure ³ (cont) (1, 10, 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.41 % rdg + 0.020 % rng 0.16 % rdg + 0.020 % rng 0.07 % rdg + 0.020 % rng 0.04 % rdg + 0.020 % rng 0.40 % rdg + 0.040 % rng 0.42 % rdg + 0.040 % rng 0.56 % rdg + 0.16 % rng	Agilent 3458A
1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.42 % rdg + 0.020 % rng 0.16 % rdg + 0.020 % rng 0.10 % rdg + 0.020 % rng 0.12 % rdg + 0.020 % rng 0.35 % rdg + 0.020 % rng 0.35 % rdg + 0.020 % rng	Agilent 3458A
3 A	(3 to 5) Hz (5 to 10) Hz 10 Hz to 5 kHz	1.2 % rdg + 0.060 % rng 0.37 % rdg + 0.060 % rng 0.17 % rdg + 0.060 % rng	HP 34401A
3 A to 1 kA	45 Hz to 5 kHz	0.80 %	AEMC clamp-on meter



Parameter/Range	Frequency	CMC ^{2, 5, 10} (\pm)	Comments
Oscilloscopes ³ –			
DC			
50 Ω	(0 to +/- 6.6) V	0.26 % + 40 μ V	Fluke 5522A/SC1100
1 M Ω	(0 to +/- 130) V	0.06 % + 40 μ V	
Square Wave			
50 Ω	(0 to +/- 6.6) V 10 Hz to 10 kHz	0.26 % + 40 μ V	
1 M Ω	(0 to +/- 130) V 10 Hz to 10 kHz	0.2 % + 40 μ V	
Level Sine Wave			
Amplitude (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 300 μ V 2.5 % + 300 μ V 5.0 % + 300 μ V 6.0 % + 300 μ V	
Flatness (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	2.0 % + 100 μ V 3.0 % + 100 μ V 5.0 % + 100 μ V 6.0 % + 100 μ V	
Time Marker	1 ns to 20 ms 50 ms to 5 s	3 μ s/s (30 + 1000 <i>t</i>) μ s/s	<i>t</i> = time in seconds

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
Universal Testing Machines, Compression Testing Machines and Tension Testing Machines ³	(0.2 to 600) lbf	0.04 % + 0.58 <i>R</i>	Deadweights, ASTM E4
	Up to 600 000 lbf	0.4 % + 0.58 <i>R</i>	Load cells; the range for testing machines in tension is only to 60 000 lbf.ASTM E4

Parameter/Equipment	Range	CMC ^{2,4,5} (\pm)	Comments
Calibration of Force Gages, Load Cells, Dynamometers & Cable Tensiometers ³	Up to 200 lbf (0 to 500) lbf (0 to 1 000) lbf (0 to 10 000) lbf	0.02 % + 0.58R 0.32 lbf + 0.58R 0.94 lbf + 0.58R 4.0 lbf + 0.58R	Comparison to Class F weights, compression & tension Master load cells – tension & compression
Pressure Gages and Transducers –			
Hydraulic ³	(10 to 15 000) psig	0.12 % rdg + 0.58R	Ametek T150 deadweight tester
Pneumatic ³	Up to 1500 psig	0.05 psig + 0.015% rdg + 0.58R	Fluke PPC3+
Pneumatic ³	Up to 100 psia	0.0025 psia + 0.025% rdg	Fluke PPC2+
Vacuum	Up to 28 inHg	0.001 inHg + 0.012 % rdg	DH Instruments PPC2+; gage pressure only, not absolute.
Torque ³ –			
Wrenches	20 in·oz to 600 ft·lbf	1.0 %	Master dead weight standards, master length standard, CDI Datatest 950-DT
Analyzers	(10 to 24 000) in·lbf	0.1 %	Class F weights and various torque wheels and arms
Guns, Drivers, Screwdrivers	(0.2 to 250) Nm	0.40 %	Crane torque transducers

Parameter/Equipment	Range	CMC ^{2,4,5} (\pm)	Comments
RPM ³ – Measure	(6 to 8300) RPM (8300 to 24999) RPM	0.02 % + 0.1 RPM 0.02 % + 1.0 RPM	Laser tachometer
Calibration of Scales and Balances ³	(1 to 20) mg (20 to 500) mg 500 mg to 5 g (5 to 20) g 20g to 20 kg	30 μ g + 0.58R 30 μ g + 0.58R 50 μ g + 0.58R 0.001 % + 0.58R 0.0005 % + 0.58R	Comparison to Class 1 weights
	0.25 oz to 1 lb (1 to 10) lb (10 to 1200) lb	0.05 % + 0.58R 0.002 % + 0.58R 0.012 % + 0.58R	Comparison to Class F weights

V. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Temperature Measuring Equipment ³ – Liquid in Glass Thermometers, Dial, RTDs, and Thermocouples	-30 °C to 200 °C	0.056 °C + 0.58R	Master PRT display with probe, temperature bath
	200 °C to 400 °C	0.14 °C + 0.58R	Block calibrations with Master PRT display with probe
Temperature – Measure ³	-196 °C to 650 °C	0.056 °C	Master PRT display with probe
Relative Humidity – Measure ³	(10 to 90) % RH (90 to 95) % RH	1.2 % RH 2.3 % RH	Vaisala HMP series

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Relative Humidity – Measuring Equipment	(10 to 95) % RH	1.3 % RH	Fluke 5128A
Ovens, Chambers, Freezers, Furnaces ^{3,9}	(-196 to 400) °C (>400 to 550) °C (550 to 800) °C (800 to 1000) °C (1000 to 1200) °C	0.14 °C 1.6 °C 3.8 °C 4.7 °C 5.6 °C	Fluke 1502 with PRT Fluke 753 with TC
IR Thermometry – Measuring Equipment ³	(50 to 100) °C (100 to 250) °C (250 to 500) °C	0.7 °C 2.7 °C 4.8 °C	Hart 9132 Emissivity $\cong 0.95$

VI. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency – Measure ³	10 Hz to 500 MHz 500 MHz to 18 GHz	0.011 μ Hz/Hz 0.002 μ Hz/Hz	HP 5334B, HP 5343A
Frequency – Measuring Equipment ³	(10 to 500) MHz	20 μ Hz/Hz	HP 3325B, Fluke 5522A
Tachometer – Optical ³	(0 to 60 000) RPM	0.001 RPM	Agilent 3325B
Stopwatches and Timers ³	(0.1 to 86 400) s	0.03 s/day	Helmut Timometer

¹ This laboratory offers commercial calibration service, field calibration service, and dimensional testing service.

² Calibration and Measurement Capability (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. Calibration and

Measurement Capabilities 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 In the statement of CMC, L is the length of the unit under test in inches; D is the diagonal of the unit under test in inches; and R is the resolution of the device under test.
- ⁵ In the statement of CMC, the first percentage given is the percentage of the reading, unless otherwise noted.
- ⁶ 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

APPLIED TECHNICAL SERVICES, INC.

Memphis, TN

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 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 8 January 2009).



Presented this 29th day of March 2018.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1888.05
Valid to March 31, 2020

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