

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

DYNAMIC TECHNOLOGY, INC.
 OPERATIONAL SUPPORT SERVICES DIV.
 3300 General Motors Rd., Bldg. #40
 Milford, MI 48380
 Tim Osborne Phone: 810 225 4601 ext. 225

CALIBRATION

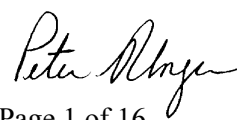
Valid To: June 30, 2011

Certificate Number: 2594.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Acoustical Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Acoustics ³ – Measure	20 Hz to 8 kHz 250 Hz reference	0.12 dB 0.12 dB	Standard reference microphone
Acoustical Measuring Equipment ³	124 dB @ 250 Hz	0.2 dB	Standard pistonphone
	114 dB @ 1 kHz 94 dB @ 1 kHz	0.48 dB 0.48 dB	Acoustical calibrator
	5 Hz to 50 kHz 5 Hz to 100 kHz	0.3 dB 0.5 dB	Electrostatic actuator



II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Calipers ³	(0.001 to 24) in	60 μin/in + 0.6R	Gage blocks
Indicators ³	(0.001 to 6) in	60 μin/in + 0.6R	Gage blocks
Micrometers ³ – Outside	(0.001 to 24) in	60 μin/in + 0.6R	Gage blocks
Height Gages ³	(0.001 to 24) in	60 μin/in + 0.6R	Gage blocks
Angle ³ – Measuring Equipment	Up to 180°	80" + 0.6R	Angle generator with rotating table
Flatness of Anvils ³ and Spindles ³	Up to 1 in diameter	11 μin	Optical flats
Linear Displacement ³	(Up to 2100) mm	350 μm	Linear encoder

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	7.1 μV/V + 1.6 μV 4.5 μV/V + 0.8 μV 3.2 μV/V + 3.2 μV 3.6 μV/V + 4.8 μV 4.6 μV/V + 48 μV 5.4 μV/V + 0.46 mV	Precision calibrator
Fixed Point	10 V	0.8 μV/V + 0.2 μV	DC voltage reference
DC Voltage ³ – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	11 μV/V + 0.4 μV 6.8 μV/V + 0.4 μV 5.5 μV/V + 0.6 μV 7.7 μV/V + 35 μV 8.7 μV/V + 0.2 mV	Precision DMM

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
DC Current ³ – Generate	(0.1 to 220) μ A 220 μ A to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A	42 μ A/A + 8 nA 36 μ A/A + 10 nA 38 μ A/A + 48 nA 53 μ A/A + 0.83 μ A 72 μ A/A + 17 μ A 0.04 % + 0.56 mA	Precision calibrator w/amplifer
	(11 to 20) A	0.34 % + 0.87 mA	
	(100 to 1000) A	0.8 % + 120 mA	w/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	19 μ A/A + 12 nA 19 μ A/A + 7.8 nA 21 μ A/A + 60 nA 39 μ A/A + 2.6 μ A 0.018 % + 14 μ A	Precision DMM
	(1 to 10) A (10 to 100) A (30 to 300) A	0.32 mA 33 μ A/A 0.011 %	w/current shunts
Resistance ³ – Generate, Fixed Points	1 Ω 1.9 Ω (10, 19) Ω 100 Ω 190 Ω (1, 1.9, 10, 19) k Ω (100, 190) k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	95 $\mu\Omega/\Omega$ 97 $\mu\Omega/\Omega$ 26 $\mu\Omega/\Omega$ 12 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ 10 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ 21 $\mu\Omega/\Omega$ 22 $\mu\Omega/\Omega$ 40 $\mu\Omega/\Omega$ 49 $\mu\Omega/\Omega$ 0.014 %	Precision calibrator
	1 Ω 10 k Ω	14 $\mu\Omega/\Omega$ + 0.6R 7 $\mu\Omega/\Omega$ + 0.6R	Precision resistors
Resistance ³ – Measure	(0 to 10) Ω (10 to 100) Ω (100 to 1000) Ω (1 to 10) k Ω (10 to 100) k Ω (100 to 1000) k Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	18 $\mu\Omega/\Omega$ + 58 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 0.58 m Ω 10 $\mu\Omega/\Omega$ + 0.58 m Ω 10 $\mu\Omega/\Omega$ + 5.8 m Ω 10 $\mu\Omega/\Omega$ + 58 m Ω 15 $\mu\Omega/\Omega$ + 2.4 Ω 60 $\mu\Omega/\Omega$ + 120 Ω 0.059 % + 1.2 k Ω 0.6 % + 12 k Ω	Precision DMM, 4-wire

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Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Generate, Fixed Points			
(2.2, 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 5 μV 0.01 % + 5 μV 90 μV/V + 5 μV 0.021 % + 5 μV 0.053 % + 6 μV 0.11 % + 12 μV 0.14 % + 23 μV 0.29 % + 23 μV	Precision calibrator
220 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 14 μV 0.01 % + 8 μV 87 μV/V + 8 μV 0.021 % + 8 μV 0.054 % + 20 μV 0.09 % + 23 μV 0.14 % + 29 μV 0.29 % + 52 μV	
2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.026 % + 46 μV 0.01 % + 17 μV 48 μV/V + 9 μV 86 μV/V + 12 μV 0.013 % + 35 μV 0.041 % + 92 μV 0.11 % + 0.23 mV 0.17 % + 0.35 mV	
22 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.026 % + 0.46 mV 94 μV/V + 0.17 mV 47 μV/V + 0.06 mV 82 μV/V + 0.12 mV 0.011 % + 0.23 mV 0.03 % + 0.7 mV 0.11 % + 2.3 mV 0.15 % + 3.7 mV	
220 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 4.6 mV 90 μV/V + 1.7 mV 54 μV/V + 0.69 mV 90 μV/V + 1.2 mV 0.015 % + 2.9 mV 0.093 % + 19 mV 0.49 % + 47 mV 0.81 % + 93 mV	
250 V	(15 to 50) Hz	0.03 % + 19 mV	w/ amplifier

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Generate, Fixed Points (cont)			
750 V	(30 to 50) kHz (50 to 100) kHz	0.042 % + 13 mV 0.15 % + 52 mV	Precision calibrator w/ amplifier
1100 V	(40 to 50) Hz 50 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	92 μV/V + 4.7 mV 69 μV/V + 4 mV 0.014 % + 6.9 mV 0.042 % + 13 mV	
AC Voltage ³ – Measure			
700 μV to 2.2 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.21 % + 1.5 μV 0.1 % + 1.5 μV 0.1 % + 1.5 μV 0.1 % + 2.3 μV 0.15 % + 3 μV 0.27 % + 4.6 μV 0.28 % + 9.2 μV 0.41 % + 9.2 μV	AC measurement standard
(2.2 to 7) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.1 % + 1.5 μV 0.048 % + 1.5 μV 0.032 % + 1.5 μV 0.051 % + 2.3 μV 0.072 % + 2.9 μV 0.14 % + 4.6 μV 0.15 % + 9.2 μV 0.27 % + 9.2 μV	
(7 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.034 % + 1.5 μV 0.023 % + 1.5 μV 0.017 % + 1.5 μV 0.025 % + 2.3 μV 0.037 % + 2.9 μV 0.094 % + 4.6 μV 0.1 % + 9.2 μV 0.2 % + 9.2 μV	
(22 to 70) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.028 % + 1.7 μV 0.014 % + 1.7 μV 80 μV/V + 1.7 μV 0.015 % + 2.3 μV 0.03 % + 2.9 μV 0.059 % + 4.6 μV 0.077 % + 9.2 μV 0.13 % + 9.2 μV	

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Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Measure (cont)			
(70 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 1.7 μV 98 μV/V + 1.7 μV 43 μV/V + 1.7 μV 80 μV/V + 2.3 μV 0.018 % + 2.9 μV 0.029 % + 4.6 μV 0.049 % + 9.2 μV 0.12 % + 9.2 μV	AC measurement standard
(220 to 700) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 1.7 μV 0.011 % + 1.7 μV 43 μV/V + 1.7 μV 60 μV/V + 2.3 μV 94 μV/V + 2.9 μV 0.02 % + 4.6 μV 0.035 % + 9.2 μV 0.11 % + 9.2 μV	
700 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.024 % 78 μV/V 28 μV/V 54 μV/V 84 μV/V 0.019 % 0.036 % 0.11 %	
(2.2 to 7) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.023 % 78 μV/V 29 μV/V 56 μV/V 94 μV/V 0.022 % 0.046 % 0.14 %	
(7 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.023 % 78 μV/V 32 μV/V 56 μV/V 95 μV/V 0.022 % 0.046 % 0.14 %	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Measure (cont)			
(22 to 70) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.023 % 79 μV/V 37 μV/V 66 μV/V 0.011 % 0.023 % 0.048 % 0.14 %	AC measurement standard
(70 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.024 % 85 μV/V 42 μV/V 84 μV/V 0.012 % 0.025 % 0.058 %	
(220 to 700) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.023 % 0.012 % 49 μV/V 0.015 % 0.058 %	
(700 to 1000) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.023 % 0.012 % 48 μV/V 0.015 % 0.058 %	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Measure (cont)			
100 μV to 10 mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.035 % + 3.5 μV 0.024 % + 1.3 μV 0.035 % + 1.3 μV 0.12 % + 1.3 μV 0.58 % + 1.3 μV 4.6 % + 2.4 μV	Precision DMM
10 mV to 10 V	(1 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	95 μV/V + 47 μV/V 92 μV/V + 24 μV/V 0.017 % + 24 μV/V 0.04 % + 24 μV/V 0.09 % + 24 μV/V 0.35 % + 0.012 % 1.2 % + 0.012 % 1.7 % + 0.012 %	
(10 to 100) V	(1 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	0.024 % + 4.7 mV 0.024 % + 2.3 mV 0.024 % + 2.3 mV 0.041 % + 2.3 mV 0.14 % + 2.3 mV 0.47 % + 12 mV 1.8 % + 12 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.47 % + 47 mV 0.47 % + 23 mV 0.07 % + 23 mV 0.14 % + 23 mV 0.35 % + 23 mV	
AC Current ³ – Measure			
(5 to 100) μA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz	0.046 % + 0.035 μA 0.18 % + 0.035 μA 0.07 % + 0.035 μA	Precision DMM
100 μA to 100 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.035 μA 0.18 % + 0.035 μA 0.07 % + 0.035 μA 0.036 % + 0.035 μA	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.47 % + 0.035 μA 0.19 % + 0.035 μA 0.1 % + 0.035 μA 0.12 % + 0.035 μA	

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Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current ³ – Generate			
(9 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % + 19 nA 0.017 % + 12 nA 0.014 % + 10 nA 0.03 % + 14 nA 0.1 % + 76 nA	Precision calibrator
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.028 % + 47 nA 0.023 % + 41 nA 0.018 % + 41 nA 0.029 % + 0.13 µA 0.11 % + 0.76 µA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % + 0.47 µA 0.017 % + 0.41 µA 0.013 % + 0.41 µA 0.021 % + 0.64 µA 0.11 % + 5.8 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % + 4.7 µA 0.017 % + 4.1 µA 0.013 % + 2.9 µA 0.021 % + 4.1 µA 0.11 % + 12 µA	w/ amplifier
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.029 % + 40 µA 0.046 % + 92 µA 0.7 % + 0.19 mA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.047 % + 0.2 mA 0.099 % + 0.44 mA 0.39 % + 0.87 mA	
(11 to 20.5) A	(1 to 5) kHz	1.2 % + 5.7 mA	
Capacitance ³ – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	1.4 % + 12 pF	Precision calibrator
(0.4 to 1.0999) nF	10 Hz to 10 kHz	1.4 % + 12 pF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	1.4 % + 12 pF	
(3.3 to 10.9999) nF	(10 to 1000) Hz	1.3 % + 12 pF	
(11 to 32.9999) nF	(10 to 1000) Hz	1.3 % + 0.12 nF	
(33 to 109.999) nF	(10 to 1000) Hz	1.3 % + 0.12 nF	
(110 to 329.999) nF	(10 to 1000) Hz	1.3 % + 0.35 nF	
(0.33 to 1.09999) µF	(10 to 600) Hz	1.3 % + 1.2 nF	
(1.1 to 3.29999) µF	(10 to 300) Hz	1.3 % + 3.5 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	1.3 % + 12 nF	

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Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Capacitance ³ – Generate (cont) (11 to 32.9999) μF (33 to 109.999) μF (110 to 329.999) μF (0.33 to 1.09999) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	 (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	 1.4 % + 35 nF 1.4 % + 0.12 μF 1.4 % + 0.35 μF 1.4 % + 1.2 μF 1.4 % + 3.5 μF 1.4 % + 12 μF 1.5 % + 35 μF 1.8 % + 120 μF	 Precision calibrator
Oscilloscopes ³ – Risetime Bandwidth	 Single Sided 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	 120 ps 1.8 % + 0.12 mV 2.4 % + 0.12 mV 4.7 % + 0.12 mV	 Precision calibrator
Distortion ³	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.3 dB	Audio analyzer

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of Thermocouples ³ – Generate and Measure Type J Type K Type T	 -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 -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 -250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	 0.32 °C + 0.6R 0.22 °C + 0.6R 0.2 °C + 0.6R 0.23 °C + 0.6R 0.28 °C + 0.6R 0.4 °C + 0.6R 0.24 °C + 0.6R 0.22 °C + 0.6R 0.32 °C + 0.6R 0.48 °C + 0.6R 0.74 °C + 0.6R 0.3 °C + 0.6R 0.22 °C + 0.6R 0.2 °C + 0.6R	 Precision calibrator

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of RTDs ³ – Measure and Generate			
Pt 385, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.05 °C + 0.6R 0.05 °C + 0.6R 0.7 °C + 0.6R 0.09 °C + 0.6R 0.1 °C + 0.6R 0.12 °C + 0.6R 0.23 °C + 0.6R	Precision calibrator; 4-wire
Pt 3926, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.06 °C + 0.6R 0.06 °C + 0.6R 0.08 °C + 0.6R 0.11 °C + 0.6R 0.12 °C + 0.6R 0.14 °C + 0.6R	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.29 °C + 0.6R 0.05 °C + 0.6R 0.06 °C + 0.6R 0.07 °C + 0.6R 0.08 °C + 0.6R 0.09 °C + 0.6R 0.11 °C + 0.6R 0.12 °C + 0.6R 0.27 °C + 0.6R	
Pt 385, 200 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.05 °C + 0.6R 0.05 °C + 0.6R 0.05 °C + 0.6R 0.06 °C + 0.6R 0.14 °C + 0.6R 0.15 °C + 0.6R 0.16 °C + 0.6R 0.19 °C + 0.6R	
Pt 385, 500 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.05 °C + 0.6R 0.06 °C + 0.6R 0.06 °C + 0.6R 0.07 °C + 0.6R 0.09 °C + 0.6R 0.09 °C + 0.6R 0.11 °C + 0.6R 0.13 °C + 0.6R	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of RTDs ³ – Measure and Generate (cont)			
Pt 385, 1000 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.04 °C + 0.6R 0.04 °C + 0.6R 0.05 °C + 0.6R 0.06 °C + 0.6R 0.07 °C + 0.6R 0.08 °C + 0.6R 0.08 °C + 0.6R 0.23 °C + 0.6R	Precision calibrator; 4-wire
Ni 120, 120 Ω	-80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C	0.09 °C + 0.6R 0.09 °C + 0.6R 0.16 °C + 0.6R	
Cu 427, 10 Ω	-100 °C to 260 °C	0.35 °C + 0.6R	

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Amplitude Modulation ³ –			
Carrier: (0.15 to 10) MHz Depth: Up to 99 %	(20 to 50) Hz 50 Hz to 100 kHz	3.5 % 2.4 %	Measuring receiver
Carrier: 10 MHz to 1.3 GHz Depth: Up to 99 %	(20 to 50) Hz 50 Hz to 100 kHz	3.5 % 3.5 %	
Frequency Modulation ³ –			
Carrier: 250 kHz to 10 MHz Dev: Up to 40 kHz	20 Hz to 10 kHz	2.4 %	Measuring receiver
Carrier: 10 MHz to 1.3 GHz Dev: Up to 400 kHz	(20 to 50) Hz 50 Hz to 100 kHz (100 to 200) kHz	5.8 % 1.3 % 5.8 %	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
Phase Modulation ³ – Carrier: 150 kHz to 10 MHz	200 Hz to 10 kHz	4.7 %	Measuring receiver
Carrier: 10 MHz to 1.3 GHz	200 Hz to 20 kHz	3.6 %	
Relative Power ³ – Measure (0 to -10) dBm (-10 to -20) dBm (-20 to -30) dBm (-30 to -40) dBm (-40 to -50) dBm (-50 to -60) dBm (-60 to -70) dBm (-70 to -80) dBm (-80 to -90) dBm (-90 to -100) dBm	10 MHz to 26.5 GHz	0.05 dB 0.05 dB 0.06 dB 0.1 dB 0.1 dB 0.11 dB 0.13 dB 0.19 dB 0.18 dB 0.34 dB	Measuring receiver

V. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Volumetric Flowrate ³	(1 to 40) gal/min	0.1 %	Volumetric prover and stopwatch

VI. Mechanical

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Balances ³	10 mg to 26.1 kg	0.002 % + 0.6R	Handbook 44 w/ Class 1 weights
Scales ³	1 g to 185 kg	0.01 % + 0.6R	Class 6 weights

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
Multi-Axis Force ³ – Compression & Tension	(0 to 1400) lbf	0.025 %	Deadweight
	(500 to 1000) lbf	1.5 lbf	Load frame with load cells
	(1000 to 2000) lbf	2.9 lbf	
	(2000 to 5000) lbf	7.1 lbf	
	(5000 to 10 000) lbf	14 lbf	
	(10 000 to 25 000) lbf	35 lbf	
	(25 000 to 50 000) lbf	71 lbf	
(50 000 to 100 000) lbf	140 lbf		
Torque ³ – Tools	(15 to 150) lbf·in	0.58 % + 0.01 ozf·in	Torque calibrator
	(10 to 100) lbf·ft	0.58 % + 0.01 lbf·ft	
	(100 to 600) lbf·ft	0.58 % + 0.1 lbf·ft	
Torque ³ – Transducers/ Dynamometers	(2 to 100) ozf·in	0.047 % + 0.03 ozf·in	Class 6 weights and torque arms
	(6 to 250) lbf·in	0.047 % + 0.03 lbf·in	
	(20 to 250) lbf·ft	0.032 % + 0.04 lbf·ft	
	(250 to 1000) lbf·ft	0.032 % + 0.14 lbf·ft	
	(1000 to 5000) lbf·ft	0.09 % + 2 lbf·ft	
Torque Ring	6000 lbf·ft	0.26 %	Calibrator w/torque cell
	800 lbf·ft	0.34 %	Dead weight
	175 lbf·ft	0.071 %	
Pressure ³ – Transducers and Gages	(0 to 300) psia	0.055 % of range + 0.6R	Pressure calibrator
	(300 to 6000) psig	0.031 % of range + 0.6R	
	(6000 to 8000) psig	0.048 % + 0.6R	
Accelerometers ³	100 Hz (ref)	8 %	Vibration transducer calibration system
	(5 to < 10) Hz	3 %	
	159 Hz (ref)	3 %	
	≥ 10 Hz to 10 kHz	3 %	
Optical Velocity Sensors ³ – Velocity Distance Sensing	(0.2 to 180) km/h	0.28 % of full scale	Speed and distance simulation with a rotating drum
Angular Velocity ³ – Rate Tables	Up to 2000°/s	0.04 % + 2 s	Rate table calibration system

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VII. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature – Measure ³	(-40 to 200) °C	0.066 °C	Precision DMM w/PRT
Temperature Measuring Equipment ³	(-40 to 200) °C	0.067 °C	Precision DMM, PRT and well
Relative Humidity – Measure ³	(10 to 90) % RH	1.9 % RH	Humidity probe

VII. Time and Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Frequency Measuring Equipment ³	10 MHz Reference	4.2 parts in 10 ¹⁰	Rubidium oscillator
	1 mHz to 21 MHz	4.2 parts in 10 ¹⁰ + 0.6R	Rubidium oscillator w/signal generator
Frequency – Measure ³	1 mHz to 225 MHz	4.2 parts in 10 ¹⁰ + 0.6R	Rubidium oscillator w/counter

¹ This laboratory offers commercial calibration service and field calibration 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, R is the numerical value of the resolution of the device measured in its respective units.

⁵ In the statement of CMC, percentages are to be read as percentage of reading, unless otherwise indicated.