



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Technical Maintenance, Inc.

117 Jetplex Circle, Suite C-4

Madison, AL 35758

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2005

and national standards

ANSI/NCSL Z540-1-1994 (R2002) AND

ANSI/NCSL Z540.3-2006 (R2013)

while demonstrating technical competence in the field of

CALIBRATION

Refer to the accompanying Scope of Accreditation for information regarding the types of calibrations to which this accreditation applies.

AC-2080.02

Certificate Number


ANAB Approval

Certificate Valid: 09/27/2017-09/20/2019

Version No. 003 Issued: 09/27/2017



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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).



**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005,
ANSI/NCSL Z540-1-1994 (R2002) AND ANSI/NCSL Z540.3-2006 (R2013)**

Technical Maintenance, Inc.

117 Jetplex Circle, Suite C4
Madison, AL 35758
Scott Chamberlain Phone:256-772-4115

CALIBRATION

Valid to: **September 20, 2019**

Certificate Number: **AC-2080.02**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Accelerometers – Acceleration – (7 to 200) Hz (100 to 2 500) Hz (2.5 to 10) kHz	(0.01 to 10) g	1.5 % of reading 1.2 % of reading 2.5 % of reading	Accelerometer Calibrator

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH ¹	(4, 7, & 10) pH units	0.019 pH	pH buffer solutions
Conductivity ¹	≈100 μS ≈1 410 μS ≈10 000 μS	0.069 μS 5.1 μS 34 μS	Conductivity solutions



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Generate ¹	0 to 220 mV	11 μ V/V + 0.4 μ V	Fluke 5730A
	(0.22 to 2.2) V	5.2 μ V/V + 0.7 μ V	
	(2.2 to 11) V	3.5 μ V/V + 2.5 μ V	
	(11 to 22) V	3.5 μ V/V + 4 μ V	
	(22 to 220) V	5 μ V/V + 40 μ V	
	(220 to 1 100) V	6.5 μ V/V + 0.4 mV	
DC Voltage – Measure ¹	Up to 100 mV	11 μ V/V + 0.3 μ V	HP 3458A
	(0.1 to 1) V	10 μ V/V + 0.3 μ V	
	(1 to 10) V	10 μ V/V + 0.5 μ V	
	(10 to 100) V	12 μ V/V + 30 μ V	
	(100 to 1 000) V	12 μ V/V + 0.1 mV	
	(1 to 30) kV	0.13 % of reading	Ross voltage dividers
	(30 to 150) kV	0.12 % of reading	
DC Current – Generate ¹	Up to 220 μ A	40 μ A/A + 6 nA	Fluke 5730A
	(0.22 to 2.2) mA	35 μ A/A + 7 nA	
	(2.2 to 22) mA	36 μ A/A + 40 nA	
	(22 to 220) mA	48 μ A/A + 0.7 μ A	
	(0.22 to 2.2) A	81 μ A/A + 12 μ A	
	(2.2 to 11) A	0.059 % of reading + 0.5 mA	Fluke 5522A
	(11 to 20.5) A	0.1 % of reading + 0.75 mA	
DC Current – Measure ¹	Up to 100 nA	31 μ A/A + 0.04 nA	HP 3458A
	(0.1 to 100) μ A	22 μ A/A + 0.8 nA	
	100 μ A to 10 mA	23 μ A/A + 50 nA	
	(10 to 100) mA	37 μ A/A + 0.5 μ A	
	(0.1 to 1) A	0.011 % of reading + 10 μ A	
	(1 to 600) A	0.3 % of reading	Current Shunts
Electrical Calibration of Thermocouple Indicating Devices ¹ –			Fluke 7526A
Type C	(0 to 2 316) °C	0.38 °C	
Type J	(-210 to 1 200) °C	0.19 °C	
Type K	(-200 to 1 372) °C	0.21 °C	
Type N	(-200 to 1 300) °C	0.27 °C	
Type R	(0 to 1 767) °C	0.45 °C	
Type S	(-250 to 400) °C	0.44 °C	
Type T	(-250 to 400) °C	0.18 °C	
Type U	(-200 to 600) °C	0.19 °C	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Power Meters ¹	3 μ W to 100 mW	0.25 % of reading	HP 11683A
Resistance – Generate, Fixed Points ¹	1, 1.9 Ω 10, 19 Ω 100, 190 Ω 1, 1.9 k Ω 10, 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	0.14 m Ω / Ω 33 $\mu\Omega$ / Ω 35 $\mu\Omega$ / Ω 15 $\mu\Omega$ / Ω 13 $\mu\Omega$ / Ω 13 $\mu\Omega$ / Ω 15 $\mu\Omega$ / Ω 18 $\mu\Omega$ / Ω 25 $\mu\Omega$ / Ω 54 $\mu\Omega$ / Ω 66 $\mu\Omega$ / Ω 0.16 Ω / Ω	Fluke 5730A
Resistance – Generate ¹	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω	40 $\mu\Omega$ / Ω + 10 m Ω 30 $\mu\Omega$ / Ω + 15 m Ω 28 $\mu\Omega$ / Ω + 15 m Ω 28 $\mu\Omega$ / Ω + 0.02 Ω 29 $\mu\Omega$ / Ω + 0.02 Ω 29 $\mu\Omega$ / Ω + 0.2 Ω 29 $\mu\Omega$ / Ω + 0.1 Ω 29 $\mu\Omega$ / Ω + 1 Ω 29 $\mu\Omega$ / Ω + 1 Ω	Fluke 5520A
Resistance – Measure ¹	Up to 10 Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (0.1 to 1) G Ω	16 $\mu\Omega$ / Ω + 50 $\mu\Omega$ 14 $\mu\Omega$ / Ω + 0.5 m Ω 12 $\mu\Omega$ / Ω + 0.5 m Ω 12 $\mu\Omega$ / Ω + 5 m Ω 12 $\mu\Omega$ / Ω + 5 m Ω 16 $\mu\Omega$ / Ω + 2.0 Ω 50 $\mu\Omega$ / Ω + 0.1 k Ω 0.05 % of reading + 1 k Ω 0.51 % of reading + 10 k Ω	HP 3458A



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate ^v	(0.22 to 2.2) mV		Fluke 5730A
	(10 to 20) Hz	0.36 mV/V + 5 μV	
	(20 to 40) Hz	0.12 mV/V + 4 μV	
	40 Hz to 20 kHz	0.11 mV/V + 4 μV	
	(20 to 50) kHz	0.24 mV/V + 4 μV	
	(50 to 100) kHz	0.6 mV/V + 5 μV	
	(100 to 300) kHz	1.3 mV/V + 10 μV	
	(300 to 500) kHz	1.7 mV/V + 20 μV	
	500 kHz to 1 MHz	3.2 mV/V + 20 μV	
	(2.2 to 22) mV		
	(10 to 20) Hz	0.36 mV/V + 5 μV	
	(20 to 40) Hz	0.12 mV/V + 4 μV	
	40 Hz to 20 kHz	0.11 mV/V + 4 μV	
	(20 to 50) kHz	0.24 mV/V + 4 μV	
	(50 to 100) kHz	0.6 mV/V + 5 μV	
	(100 to 300) kHz	1.3 mV/V + 10 μV	
	(300 to 500) kHz	1.7 mV/V + 20 μV	
	500 kHz to 1 MHz	3.2 mV/V + 20 μV	
	(22 to 220) mV		
	(10 to 20) Hz	0.24 mV/V + 12 μV	
	(20 to 40) Hz	0.11 mV/V + 7 μV	
	40 Hz to 20 kHz	69 μV/V + 7 μV	
	(20 to 50) kHz	0.14 mV/V + 7 μV	
	(50 to 100) kHz	0.37 mV/V + 17 μV	
(100 to 300) kHz	0.77 mV/V + 20 μV		
(300 to 500) kHz	1.7 mV /V + 25 μV		
500 kHz to 1 MHz	3.2 mV /V + 45 μV		
(0.22 to 2.2) V			
(10 to 20) Hz	0.28 mV/V + 40 μV		
(20 to 40) Hz	0.11 mV/V + 15 μV		
40 Hz to 20 kHz	50 μV/V + 8 μV		
(20 to 50) kHz	78 μV/V + 10 μV		
(50 to 100) kHz	0.1 mV/V + 30 μV		
(100 to 300) kHz	0.4 mV/V + 80 μV		
(300 to 500) kHz	1.2 mV /V + 0.2 mV		
500 kHz to 1 MHz	0.2 mV/V + 0.3 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate ¹	(2.2 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	0.28 mV/V + 0.4 mV 0.11 mV/V + 0.15 mV 50 μV/V + 50 μV 78 μV/V + 0.1 mV 98 μV/V + 0.2 mV 0.3 mV/V + 0.6 mV 1.2 mV/V + 2 mV 1.8 mV/V + 3.2 mV	Fluke 5730A
	(22 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 500 kHz to 1 MHz	0.28 mV/V + 4 mV 0.11 mV/V + 1.5 mV 62 μV/V + 0.6 mV 93 μV/V + 1 mV 0.18 mV/V + 2.5 mV 1.1 mV/V + 16 mV 5.1 mV/V + 40 mV 9.3 mV/V + 80 mV	
AC Voltage – Generate ¹	(220 to 750) V (30 to 50) kHz (50 to 100) kHz (750 to 1 000) V 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.7 mV/V + 11 mV 2.7 mV/V + 45 mV 0.11 mV/V + 4 mV 0.2 mV/V + 6 mV 0.7 mV/V + 11 mV	Fluke 5730A/5725A
AC Voltage – Measure ¹	Up 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	0.044 % of reading + 0.003 mV 0.026 % of reading + 0.0011 mV 0.044 % of reading + 0.0011 mV 0.11 % of reading + 0.0011 mV 0.5 % of reading + 0.0011 mV 4 % of reading + 0.002 mV	HP 3458A



AC Voltage – Measure ¹	10 mV to 100 mV		
	(1 to 40) Hz	0.019 % of reading + 0.004 mV	
	40 Hz to 1 kHz	0.019 % of reading + 0.002 mV	
	(1 to 20) kHz	0.027 % of reading + 0.002 mV	
	(20 to 50) kHz	0.045 % of reading + 0.002 mV	
	(50 to 100) kHz	0.09 % of reading + 0.002 mV	
	(100 to 300) kHz	0.31 % of reading + 0.01 mV	
	300 kHz to 1 MHz	1 % of reading + 0.01 mV	
	(1 to 2) MHz	1.5 % of reading + 0.01 mV	
	100 mV to 1 V		
	(1 to 40) Hz	0.019 % of reading + 0.04 mV	
	40 Hz to 1 kHz	0.019 % of reading + 0.02 mV	
	(1 to 20) kHz	0.027 % of reading + 0.02 mV	
	(20 to 50) kHz	0.045 % of reading + 0.02 mV	
	(50 to 100) kHz	0.09 % of reading + 0.02 mV	
(100 to 300) kHz	0.31 % of reading + 0.1 mV		
300 kHz to 1 MHz	1 % of reading + 0.1 mV		
(1 to 2) MHz	1.5 % of reading + 0.1 mV		
1 V to 10 V			
(1 to 40) Hz	0.019 % of reading + 0.0004 V		
40 Hz to 1 kHz	0.019 % of reading + 0.0002 V		
(1 to 20) kHz	0.027 % of reading + 0.0002 V		
(20 to 50) kHz	0.045 % of reading + 0.0002 V		
(50 to 100) kHz	0.09 % of reading + 0.0002 V		
(100 to 300) kHz	0.31 % of reading + 0.001 V		
300 kHz to 1 MHz	1 % of reading + 0.001 V		
(1 to 2) MHz	1.5 % of reading + 0.001 V		
(10 to 100) V			
(1 to 40) Hz	0.026 % of reading + 0.002 V		
40 Hz to 1 kHz	0.041 % of reading + 0.002 V		
(1 to 20) kHz	0.038 % of reading + 0.002 V		
(20 to 50) kHz	0.048 % of reading + 0.002 V		
(50 to 100) kHz	0.13 % of reading + 0.002 V		
(100 to 300) kHz	0.4 % of reading + 0.01 V		
300 kHz to 1 MHz	1.5 % of reading + 0.01 V		
(100 to 700) V			
(1 to 40) Hz	0.05 % of reading + 0.04 V		
40 Hz to 1 kHz	0.05 % of reading + 0.02 V		
(1 to 20) kHz	0.07 % of reading + 0.02 V		
(20 to 50) kHz	0.13 % of reading + 0.02 V		
(50 to 100) kHz	0.3 % of reading + 0.02 V		
(1 to 21) kV			
Up to 400 Hz	0.59 % of reading		
(21 to 100) kV			
Up to 400 Hz	0.62 % of reading		
		HP 3458A	
		Ross voltage dividers	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Generate ¹	(9 to 220) μ A		Fluke 5730A
	(10 to 20) Hz	0.31 mA/A + 16 nA	
	(20 to 40) Hz	0.21 mA/A + 10 nA	
	40 Hz to 1 kHz	0.15 mA/A + 8 nA	
	(1 to 5) kHz	0.35 mA/A + 12 nA	
	(5 to 10) kHz	1.3 mA/A + 65 nA	
	(0.22 to 2.2) mA		
	(10 to 20) Hz	0.3 mA/A + 40 nA	
	(20 to 40) Hz	0.16 mA/A + 35 nA	
	40 Hz to 1 kHz	0.14 mA/A + 35 nA	
	(1 to 5) kHz	0.25 mA/A + 0.11 μ A	
	(5 to 10) kHz	1.3 mA/A + 0.65 μ A	
	(2.2 to 22) mA		
	(10 to 20) Hz	0.31 mA/A + 0.4 μ A	
	(20 to 40) Hz	0.2 mA/A + 0.35 μ A	
	40 Hz to 1 kHz	0.14 mA/A + 0.35 μ A	
	(1 to 5) kHz	0.26 mA/A + 0.55 μ A	
	(5 to 10) kHz	1.4 mA/A + 5 μ A	
	(22 to 220) mA		
	(10 to 20) Hz	0.3 mA/A + 4 μ A	
(20 to 40) Hz	0.2 mA/A + 3.5 μ A		
40 Hz to 1 kHz	0.14 mA/A + 2.5 μ A		
(1 to 5) kHz	0.26 mA/A + 3.5 μ A		
(5 to 10) kHz	1.4 mA/A + 10 μ A		
(0.22 to 2.2) A			
20 Hz to 1 kHz	0.3 mA/A + 35 μ A		
(1 to 5) kHz	0.54 mA/A + 80 μ A		
(5 to 10) kHz	8.2 mA/A + 0.16 mA		
AC Current – Generate ¹	(2.2 to 11) A		Fluke 5730A/5725A
	40 Hz to 1 kHz	0.56 mA/A + 0.17 mA	
	(1 to 5) kHz	1.2 mA/A + 0.38 mA	
	(5 to 10) kHz	4.3 mA/A + 0.75 mA	
AC Current – Generate ¹	(11 to 20.5) A		Fluke 5522A
	45 Hz to 100 Hz	0.19 % of reading + 5 mA	
	100 Hz to 1 kHz	0.24 % of reading + 5 mA	
	(1 to 5) kHz	4.6 % of reading + 5 mA	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	Up to 100 μ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 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 (0.1 to 1) A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 Hz (5 to 20) kHz (20 to 50) kHz	0.41 % of reading + 0.03 pA 0.16 % of reading + 0.03 pA 0.07 % of reading + 0.03 pA 0.41 % of reading + 20 μ A 0.16 % of reading + 20 μ A 0.069 % of reading + 20 μ A 0.038 % of reading + 20 μ A 0.069 % of reading + 20 μ A 0.41 % of reading + 40 μ A 0.56 % of reading + 0.15 mA 0.41 % of reading + 0.2 mA 0.17 % of reading + 0.2 mA 0.087 % of reading + 0.2 mA 0.11 % of reading + 0.2 mA 0.31 % of reading + 0.2 mA 1 % of reading + 0.4 mA	HP 3458A
AC Current – Measure ¹	(1 to 600) A 30 Hz to 10 kHz	3.5 % of reading	Current Clamp
Capacitance ¹ – Generate 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz (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	(0.19 to 0.1099) nF (1.1 to 3.2999) nF (3.3 to 329.999) nF (0.33 to 1.09999) μ F (1.1 to 3.29999) μ F (3.3 to 10.9999) μ F (11 to 32.999) μ F (33 to 109.999) μ F (110 to 329.999) μ F (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	1.2 % of reading + 0.01 nF 1.2 % of reading + 0.01 nF 0.39 % of reading + 0.3 nF 0.38 % of reading + 3 nF 0.37 % of reading + 3 nF 0.38 % of reading + 10 nF 0.53 % of reading + 30 nF 0.58 % of reading + 0.1 μ F 0.58 % of reading + 0.3 μ F 0.57 % of reading + 1 μ F 0.58 % of reading + 3 μ F 0.59 % of reading + 10 μ F 0.65 % of reading + 30 μ F 1.3 % of reading + 0.1 mF	Fluke 5522A



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ¹ – Amplitude – Square Wave 50 Ω 1 MΩ Rise Time Flatness (50 kHz reference) Time Marker ²	1 mVpp to 6.6 Vpp 1 mVpp to 130 Vpp <350 ps 5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz 1 ns to 20 ms 50 ms to 5 s	1.3 % of reading + 40 μV 1.3 % of reading + 40 μV + 13 ps / -0.11 ps 2.5 % of reading + 0.1 mV 3.4 % of reading + 0.1 mV 5.5 % of reading + 0.1 mV 6.9 of reading % + 0.1 mV 2.7 parts in 10 ⁶ s (25 + 1 000t) parts in 10 ⁶ s	Fluke 5522A /SC1100
Low Frequency Power – Generate ¹ (45 to 65) Hz 1 PF DC	Up to 20 kW	0.25 % of reading 0.21 % of reading	Fluke 5522A

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Attenuation ¹ – Measure	100 kHz to 50 GHz (-10 to 0) dB (-20 to -11) dB (-30 to -21) dB (-40 to -31) dB (-50 to -41) dB (-60 to -51) dB (-70 to -61) dB (-80 to -71) dB (-90 to -81) dB	0.019 dB 0.022 dB 0.027 dB 0.032 dB 0.037 dB 0.055 dB 0.06 dB 0.064 dB 0.069 dB	Agilent N5531S



Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Attenuation ¹ – Measure	100 kHz to 31.15 GHz (-100 to -91) dB 100 kHz to 26.5 GHz (-110 to -101) dB (-120 to -111) dB	0.074 dB 0.086 dB 0.091 dB	Agilent N5531S
RF Power ¹ – Measure 50 MHz	1 mW	0.003 2 mW	HP 432A & 8478B
RF Power – Generate	250 kHz to 20 GHz (-10 to 10) dBm (-70 to -10) dBm (-90 to -70) dBm (20 to 50) GHz (-10 to 10) dBm (-70 to -10) dBm (-90 to -70) dBm	1.5 dBm 1.6 dBm 1.7 dBm 1.6 dBm 1.7 dBm 2.6 dBm	Agilent E8257D
Amplitude Modulation ¹ – Measure	100 kHz to 10 MHz (5 to 99) % Depth 10 MHz to 3 GHz (5 to 20) % Depth (20 to 99) % Depth (3 to 26.5) GHz (5 to 20) % Depth (20 to 99) % Depth (26.5 to 31.5) GHz (5 to 20) % Depth (20 to 99) % Depth (31.5 to 50) GHz (5 to 20) % Depth (20 to 99) % Depth	1 % Depth 2.9 % Depth 0.8 % Depth 5.2 % Depth 1.8 % Depth 7.9 % Depth 2.3 % Depth 30 % Depth 7 % Depth	Agilent N5531S
Frequency Modulation ¹ – Measure	20 Hz to 10 kHz 250 kHz to 10 MHz (50 to 200) Hz 10 MHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 31.15) GHz (31.15 to 50) GHz	3.1 % of reading 3.1 % of reading 3.8 % of reading 5 % of reading 11 % of reading	Agilent N5531S
Phase Modulation ¹ – Measure	100 kHz to 50 GHz	9.7 % of reading	Agilent N5531S



Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power ¹ – 100 kHz to 2.6 GHz (0.1 to 26.5) GHz	(0.01 to 30) dBm	2 % of reading 3.4 % of reading	HP 8902A/HP 11722A HP 8902A/HP 11792A
AM Distortion ¹ – Measure	(0.1 to 10) MHz 10 MHz to 26.5 GHz (26.5 to 50) GHz	0.8 % of reading 1 % of reading 6.2 % of reading	Agilent N5531S
FM Distortion ¹ – Measure	1 MHz to 50 GHz	0.3 % of reading	Agilent N5531S

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2}	Up to 46 in	(26 + 10L) μin	Gage blocks (Grade 2)
Micrometers ^{1,2}	Up to 46 in	(30 + 6L) μin	
Height Gages ^{1,2}	Up to 46 in	(200 + 3L) μin	
Dial Indicators ^{1,2}	Up to 10 in	(5 + 57L) μin	
Rulers ¹	Up to 46 in	0.009 1 in	
Metal Tapes and Rules ^{1,2}	Up to 100 ft	(0.000 023L + 0.023) in	Standard rule
Feeler Gages ¹	Up to 1 in	73 μin	Mitutoyo 293-369 micrometer
Cylindrical gages ^{1,2} – Plain Pins, Plugs Rings	Up to 1 in (1 to 10) in Up to 14 in	11 μin (7 + 4D) μin (8.0 + 2D) μin	P&W LabMaster gage blocks (grade 1)
Surface Plates ¹ – Overall Flatness	(18 × 18) in to (6 × 6) ft	95 μin	Rahn Planekator
Local Area Flatness	Up to (18 × 18) in	74 μin	Repeat-o-meter
Gage Blocks ²	Up to 10 in	(2.9 + 2.2L) μin	Universal measuring machine, master gage block set



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plugs – Major Diameter Pitch Diameter	Up to 12 in Up to 12 in	52 µin 110 µin	Gage blocks, P&W universal measuring machine, VanKeren thread wire set
Optical Comparators ¹ – Linearity	Up to 20 in (20 to 40) in	590 µin 790 µin	Precision balls, Starrett Webber 81, SI Industries glass scales
Magnification	10x to 100x	670 µin	
Protractors ¹	(0 to 360) °	0.019 °	Angle blocks
Coating Thickness Gages ¹ – Eddy Current & Magnetic Induction, Fixed Point	(0.48 to 38.9) mils	89 µin	Calibration foils, P&W Supermicrometer
Coating Thickness Shims ¹	(0 to 243) mils	80 µin	P&W Supermicrometer

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales & Balances ^{1,2}	(1 to 200) g	0.29 mg + 0.6R	Class 1 weights
	(0.022 to 2 000) lb	0.01 % of reading + 0.6R	Class F weights
Pressure ¹	(-14 to 5) psi	0.071 psi	Fluke 700PD6
	(5 to 10 000) psi	0.12 % of reading	Ametek R-100
	(0 to 30) psia	0.019 psi	Fluke 700GA5
	(0 to 100) cmH ₂ O	0.071 cmH ₂ O	Heise 710B
	(0 to 20) inH ₂ O	0.0018 inH ₂ O	Additel 681-DP20
	(20 to 150) inH ₂ O	0.11 inH ₂ O	Additel 681-DP150
Vacuum	(0 to 30) inHg	0.12 inHg	Fluke 700PD6



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Wrenches ¹	(5 to 1 000) lbf·in (25 to 250) lbf·ft (250 to 2 000) lbf·ft	0.35 % of reading 0.43 % of reading 0.49 % of reading	CDI torque system
Torque Analyzers	(5 to 80) ozf·in (5 to 600) lbf·in (50 to 2 000) lbf·ft	0.17 % of reading 0.15 % of reading 0.14 % of reading	Weights and Wheel
Mass	(1 to 10) lb	0.048 g	Master balance
Force – Tension ¹	(10 to 200) mgrf (0.2 to 1) grf (1 to 10) grf (10 to 500) grf (1 to 540) lbf	0.63 mgrf 1 mgrf 0.038 % of reading 0.025 % of reading 0.026 % of reading	Class F weights

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Measuring Equipment ¹	(50 to 600) °C	0.11 °C	Hart 1502A w/5626 PRT and dry block
Temperature – Measure ¹	(-25 to 600) °C	0.026 °C	Hart 1502 with 5626 PRT
Relative Humidity – Measure ¹	(0 to 90) % RH	1.6 %RH	Vaisalla HM141/HMP46
IR Thermometry ¹	(20 to 100) °C (100 to 300) °C (300 to 500) °C	0.51 °C 0.61 °C 0.8 °C	Fluke 9132

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	10 MHz	1 part in 10 ¹¹ Hz/Hz	GPS 58503A/B
	10 Hz to 500 MHz	5 parts in 10 ⁷ Hz/Hz	HP 5345A



Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	500 MHz to 26.5 GHz (26.5 to 40) GHz	1.7 parts in 10 ⁹ Hz/Hz 1 parts in 10 ⁷ Hz/Hz	HP 5343A

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k=2$), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. L = length in inches, D = diameter in inches, t = time in seconds, R = resolution of device under test.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2080.02.



Vice President

