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.
3000 Northwoods Parkway, Suite 270
Norcross, GA 30071

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

ISO/IEC 17025:2005

and national standards

ANSI/NCSL Z540-1-1994 AND
ANSI/NCSL Z540.3-2006

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-2080.01
Certificate Number

ANAB Approval

Certificate Valid: 10/14/2016-09/20/2018
Version No. 001 Issued: 10/14/2016

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 January 2009).

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

Technical Maintenance, Inc.
3000 Northwoods Parkway, Suite 270
Norcross, GA 30071
Scott Chamberlain Phone:770-409-8348

CALIBRATION

Valid to: September 20, 2018 Certificate Number: AC-2080.01

Chemical

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
pH – Meters[3]	(4, 7, 10) pH	0.02 pH	Standard pH buffers

Dimensional

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Calipers[2,3]	Up to 46 in	(47 + 8*L*) µin	Grade 2 gage blocks
Micrometers[2,3]	Up to 46 in	(28 + 5*L*) µin	Grade 2 gage blocks
Bore Micrometers	(0.125 to 2) in	98 µin	Master ring gages
Dial Indicators[2,3]	Up to 0.2 in Up to 6 in Up to 1 in	15 µin (81 + 1.2*L*) µin 150 µin	Grade 2 gage blocks Starrett 716
Height Gages[2,3]	Up to 46 in	(300 + 2*L*) µin	Grade 2 gage blocks
Scales – Rulers[3]	Up to 46 in	0.009 in	Grade 2 gage blocks
Feeler Gages[3]	Up to 1 in	93 µin	Mitutoyo 293-369
Surface Plates[3] – Overall Flatness Local Area Flatness	 (18 x 18) in to (6 × 6) ft Up to (6x6) ft	 170 µin 120 µin	 Rahn Planekator Repeat-o-meter

Dimensional

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Gage Blocks[2]	Up to 10 in	(3.3 + 2.5*L*) µin	Universal measuring machine, master gage block set
Protractors[3]	(0 to 360) º	0.014 º	Angle blocks
Radius Gages	(0.125 to 1) inch	340 µin	Optical comparator
Cylindrical Gages[2,3] – Plain Pin, Plugs Rings	 (0 to 12) in (0.04 to 14) in	 (5.4 + 2.2*D*) µin (16 + 1.5*D*) µin	Master gage blocks, P&W universal measuring machine
Thread Plugs – Major Pitch Diameter (6 to 80) TPI	 Up to 12 in Up to 12 in	 36 µin 91 µin	Gage blocks, P & W universal measuring machine, VanKeren thread wire set
Thread Rings[2]	Up to 12 in	(350 + 47*D*) µin	Thread setting plug gages

Dimensional Testing

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
1D Length	Up to 12 in	350 µin	Optical comparator
Angle	Up to 360º	0.06º	

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
DC Voltage – Generate[3]	Up to 220 mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1 100) V	11 µV/V + 0.4 µV 8.2 µV/V + 0.7 µV 7.1 µV/V + 2.5 µV 7.1 µV/V + 4 µV 8.2 µV/V + 40 µV 10 µV/V + 0.4 mV	Fluke 5720A
	(1 to 60) kV	0.13 %	Ross VD60
DC Voltage – Measure[3]	Up to 100 mV (0.1to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	10 µV/V + 0.3 µV 9 µV/V + 0.3 µV 9 µV/V + 0.5 µV 11 µV/V + 30 µV 11 µV/V + 0.1 mV	HP 3458A
	(1 to 6) kV	2.3 % + 10 V	Associated Research 5560DT

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
DC Current – Generate[3]	Up to 220 µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	55 µA/A + 6 nA 50 µA/A + 7 nA 50 µA/A + 40 nA 60 µA/A + 0.7 µA 98 µA/A + 12 µA	Fluke 5720A
	(2.2 to 20.5) A	0.11 % + 750 µA	Fluke 5522A
DC Current – Generate[3]Clamp Only	Up to 1 000 A	0.77 % + 0.5 A	Fluke 5522A / coil
DC Current – Measure[3]	Up to 100 nA (0.1 to 1) µA (1 to 10) µA (10 to 100) µA (0.1to 10) mA (10 to 100) mA (0.1 to 1) A	36 µA/A + 0.04 nA 24 µA/A + 0.04 nA 24 µA/A + 0.1 nA 24 µA/A + 0.8 nA 25 µA/A + 0.05 µA 43 µA/A + 0.5 µA 0.14 mA/A + 10 µA	HP 3458A
	(1 to 500) A	0.32 %	Current shunts
Resistance[3] – Fixed Points	1 Ω, 1.9 Ω 10 Ω, 19 Ω 100 Ω, 190 Ω 1 kΩ, 1.9 kΩ 10 kΩ, 19 kΩ 100 kΩ, 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	0.12 mΩ/Ω 31 µΩ/Ω 23 µΩ/Ω 12 µΩ/Ω 13 µΩ/Ω 14 µΩ/Ω 24 µΩ/Ω 26 µΩ/Ω 50 µΩ/Ω 59 µΩ/Ω 0.14 mΩ/Ω	Fluke 5720A
Resistance[3] – Generate	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (0.33 to 1.1) GΩ	47 µΩ/Ω + 10 mΩ 42 µΩ/Ω + 15 mΩ 34 µΩ/Ω + 15 mΩ 32 µΩ/Ω + 0.02 Ω 33 µΩ/Ω + 0.02 Ω 33 µΩ/Ω + 0.1 Ω 33 µΩ/Ω + 0.1 Ω 33 µΩ/Ω + 1 Ω 33 µΩ/Ω + 1 Ω 37 µΩ/Ω + 10 Ω 37 µΩ/Ω + 10 Ω 70 µΩ/Ω + 0.15 kΩ 0.015 % + 0.25 kΩ 0.029 % + 2.5 kΩ 0.06 % + 3 kΩ 0.35 % + 0.1 MΩ 1.7 % + 0.5 MΩ	Fluke 5522A
Resistance – Measure[3]	Up to 10 Ω (10 to 100) Ω (0.1 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ	18 µΩ/Ω + 5 µΩ 15 µΩ/Ω + 5 µΩ 13 µΩ/Ω + 5 mΩ 18 µΩ/Ω + 2 Ω 58 µΩ/Ω + 0.1 kΩ 0.059 % + 1 kΩ 0.29 % + 10 kΩ	HP 3458A

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Capacitance – Generate[3]	(0.19 to 0.1099) nF (1.1 to 3.299) nF (3.3 to 329.999) nF (0.33 to 3.29999) µF (3.3 to 10.999) µF (10.999 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	0.6 % + 0.01 nF 0.32 % + 0.01 nF 0.32 % + 0.3 nF 0.32 % + 3 nF 0.32 % + 10 nF 0.48 % + 30 nF 0.54 % + 0.1 µF 0.55 % + 0.3 µF 0.54 % + 1 µF 0.54 % + 3 µF 0.54 % + 10 µF 0.87 % + 30 µF 1.3 % + 100 µF	Fluke 5522A
Capacitance – Measure[3]	0.1 pF to 10 mF	0.78 % of rdg	Fluke PM 6304C
AC Voltage – Generate[3]	Up 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 (22 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 (0.22 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 (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	 0.36 mV/V + 5 µV 0.15 mV/V + 5 µV 0.13 mV/V + 5 µV 0.3 mV/V + 5 µV 0.71 mV/V + 6 µV 1.6 mV/V + 12 µV 2 mV/V + 25 µV 4 mV/V + 25 µV 0.35 mV/V + 15 µV 0.14 mV/V + 8 µV 0.12 mV/V + 8 µV 0.29 mV/V + 8 µV 0.7 mV/V + 20 µV 1.3 mV/V + 25 µV 2 mV/V + 30 µV 3.9 mV/V + 60 µV 0.51 mV/V + 50 µV 0.4 mV/V + 20 µV 0.38 mV/V + 10 µV 1.4 mV/V + 12 µV 0.41 mV/V + 40 µV 0.69 mV/V + 0.1 mV 1.5 mV/V + 0.25 mV 2.4 mV/V + 0.4 mV 0.48 mV/V + 0.5 mV 0.39 mV/V + 0.2 mV 0.38 mV/V + 70 µV 0.39 mV/V + 0.12 mV 0.4 mV/V + 0.25 mV 0.5 mV/V + 0.8 mV 1.3 mV/V + 2.5 mV 1.9 mV/V + 4 mV	Fluke 5720A

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
AC Voltage – Generate[3]	(22 to 220) V		Fluke 5720A
	(10 to 20) Hz	0.51 mV/V + 5 mV
	(20 to 40) Hz	0.4 mV/V + 2 mV
	40 Hz to 20 kHz	0.38 mV/V + 0.7 mV
	(20 to 50) kHz	0.39 mV/V + 1.2 mV
	(50 to 100) kHz	0.43 mV/V + 3 mV
	(100 to 300) kHz	1.4 mV/V + 20 mV
	(300 to 500) kHz	6.3 mV/V + 50 mV
	500 kHz to 1 MHz	12 mV/V + 0.1 V
	(220 to 1 100) V		Fluke 5720A/5725A
	40 Hz to 1 kHz	0.38 mV/V + 0.7 mV
	(1 to 20) kHz	0.39 mV/V + 1.2 mV
	(20 to 30) kHz	0.43 mV/V + 3 mV
	(220 to 750) V	
	(30 to 50) kHz	0.39 mV/V + 1.2 mV
	(50 to 100) kHz	0.43 mV/V + 3 mV
	(1 to 5) kV		Associated Research 5560 DT
	(50, 60) Hz	2.4 % + 10 V
AC Voltage – Measure[3]	Up to 10 mV		HP 3458A
	(1 to 40) Hz	0.044 % + 0.003 mV
	40 Hz to 1 kHz	0.026 % + 0.0011 mV
	(1 to 20) kHz	0.044 % + 0.0011 mV
	(20 to 50) kHz	0.11 % + 0.0011 mV
	(50 to 100) kHz	0.5 % + 0.0011 mV
	(100 to 300) kHz	4 % + 0.002 mV
	10 mV to 100 mV	
	(1 to 40) Hz	0.019 % + 0.004 mV
	40 Hz to 1 kHz	0.019 % + 0.002 mV
	(1 to 20) kHz	0.027 % + 0.002 mV
	(20 to 50) kHz	0.045 % + 0.002 mV
	(50 to 100) kHz	0.09 % + 0.002 mV
	(100 to 300) kHz	0.31 % + 0.01 mV
	300 kHz to 1 MHz	1 % + 0.01 mV
	(1 to 2) MHz	1.5 % + 0.01 mV
	(0.1 to 1) V	
	(1 to 40) Hz	0.019 % + 0.04 mV
	40 Hz to 1 kHz	0.019 % + 0.02 mV
	(1 to 20) kHz	0.027 % + 0.02 mV
	(20 to 50) kHz	0.045 % + 0.02 mV
	(50 to 100) kHz	0.09 % + 0.02 mV
	(100 to 300) kHz	0.31 % + 0.1 mV
	300 kHz to 1 MHz	1 % + 0.1 mV
	(1 to 2) MHz	1.5 % + 0.1 mV
	(1 to 10) V	
	(1 to 40) Hz	0.019 % + 0.0004 V
	40 Hz to 1 kHz	0.019 % + 0.0002 V
	(1 to 20) kHz	0.027 % + 0.0002 V
	(20 to 50) kHz	0.045 % + 0.0002 V
	(50 to 100) kHz	0.09 % + 0.0002 V
	(100 to 300) kHz	0.31 % + 0.001 V
	300 kHz to 1 MHz	1 % + 0.001 V
	(1 to 2) MHz	1.5 % + 0.001 V

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
AC Voltage – Measure[3]	(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 (100 to 700) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	 0.026 % + 0.002 V 0.041 % + 0.002 V 0.038 % + 0.002 V 0.048 % + 0.002 V 0.13 % + 0.002 V 0.4 % + 0.01 V 1.5 % + 0.01 V 0.05 % + 0.04 V 0.05 % + 0.02 V 0.07 % + 0.02 V 0.13 % + 0.02 V 0.3 % + 0.02 V	HP 3458A
	(1 to 42) kV (50 to 60) Hz	6.3 V	Ross VD60
AC Current – Generate[3]	Up to 200 µA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.2 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 (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 (22 to 200) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.2 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.36 mA/A + 20 nA 0.25 mA/A + 12 nA 0.19 mA/A + 10 nA 0.42 mA/A + 15 nA 1.6 mA/A + 80 nA 0.36 mA/A + 50 nA 0.25 mA/A + 40 nA 0.18 mA/A + 40 nA 0.3 mA/A + 0.18 µA 1.6 mA/A + 0.8 µA 0.26 mA/A + 0.5 µA 0.24 mA/A + 0.4 µA 0.18 mA/A + 0.4 µA 0.3 mA/A + 0.7 µA 1.6 mA/A + 6 µA 0.36 mA/A + 5 µA 0.24 mA/A + 4 µA 0.18 mA/A + 3 µA 0.3 mA/A + 4 µA 1.6 mA/A + 12 µA 0.28 mA/A + 40 µA 0.6 mA/A + 0.1 mA 9.3 mA/A + 0.2 mA	Fluke 5720A
	(2.2 to 11) A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.81 mA/A + 0.17 mA 1.3 mA/A + 0.38 mA 4.3 mA/A + 0.75 mA	Fluke 5720A/5725A
	(20.5 to 1 000) A (45 to 440) Hz	 1.5 % + 0.9 A	Fluke 5522A / coil

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
AC Current – Measure[3]	Up to 100 µA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (0.1 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 kHz (5 to 20) kHz (20 to 50) kHz	 0.47 % + 0.03 pA 0.19 % + 0.03 pA 0.084 % + 0.03 pA 0.47 % + 20 µA 0.18 % + 20 µA 0.09 % + 20 µA 0.042 % + 20 µA 0.078 % + 20 µA 0.47 % + 40 µA 0.64 % + 0.15 mA 0.47 % + 0.2 mA 0.19 % + 0.2 mA 0.10 % + 0.2 mA 0.12 % + 0.2 mA 0.35 % + 0.2 mA 1.2 % + 0.4 mA	HP 3458A
	(1 to 50) A (45 to 400) Hz	0.06 %	Current shunt
Low Frequency Power – Generate[3] (45 to 65) Hz 1 PF	Up to 20 kW	0.42 % of rdg	Fluke 5522A
Electrical Calibration of Thermocouple Indicators[3] – Type J Type K Type N Type T	 (-210 to 1 200) °C (-200 to 1 372) °C (-200 to 1 300) °C (-250 to 400) °C	 0.34 °C 0.48 °C 0.47 °C 0.74 °C	Fluke 5522A
Electrical Calibration of RTD Indicators[2,3] – Pt 385, 100 Ω Pt 3926, 100 Ω Pt 3916, 100 Ω Pt 385, 200 Ω PtNi 385, 120 Ω (Ni120) Cu 427, 10 Ω [3]	 (-200 to 800) °C (-200 to 800) °C (-200 to 630) °C (-200 to 800) °C (-80 to 260) °C (100 to 260) °C	 (0.08 + 0.00021*T*) °C (0.08 + 0.00011*T*) °C (0.12 + 0.00005*T*) °C (0.10 + 0.00022*T*) °C (0.11 + 0.00023*T*) °C 0.35 °C	Fluke 5522A

Electrical – DC/Low Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Oscilloscopes[3] –			
Vertical Deflection			
1 kHz Square Wave into a 50 Ω load	1 mV to 6.6 $V_{pk - pk}$	0.89 % + 40 µV	
1 kHz Square Wave into a 1 MΩ load	1 mV to 130 $V_{pk - pk}$	0.35 % + 40 µV	
Rise Time	>300 ps	(+15 / -120) ps	Fluke 5522A/SC1100
Flatness	50 kHz to 100 MHz	2.3 % + 0.1 mV	
Leveled Sine Wave	(100 to 300) MHz	2.6 % + 0.1 mV	
5 mV to 5.5 V	(300 to 600) MHz	4.9 % + 0.1 mV	
Reference at 50 kHz	(600 to 1 100) MHz	6.1 % + 0.1 mV	
Time Interval[2]	1 ns to 20 ms	3.9 µs/s	
	50 ms to 5 s	(29 + 1 000*t*) µs/s	

Electrical – RF/Microwave

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Attenuation[3] – Measure			
10 MHz to 50 GHz	(-10 to 0) dB	0.025 dB	
10 MHz to 50 GHz	(-20 to -11) dB	0.025 dB	
10 MHz to 50 GHz	(-30 to -21) dB	0.025 dB	
10 MHz to 50 GHz	(-40 to -31) dB	0.025 dB	
10 MHz to 50 GHz	(-50 to -41) dB	0.025 dB	
10 MHz to 50 GHz	(-60 to -51) dB	0.043 dB	Agilent E4448A with N5532S
10 MHz to 50 GHz	(-70 to -61) dB	0.043 dB	
10 MHz to 45 GHz	(-80 to -71) dB	0.043 dB	
10 MHz to 41 GHz	(-90 to -81) dB	0.043 dB	
10 MHz to 31.15 GHz	(-100 to -91) dB	0.043 dB	
10 MHz to 26.5 GHz	(-110 to -101) dB	0.056 dB	
10 MHz to 3.05 GHz	(-120 to -111) dB	0.057 dB	
RF Power – Measure			
100 kHz to 4.2 GHz	(-30 to 20) dBm	4.2 % of rdg	HP 8482A
10 MHz to 18 GHz		4.9 % of rdg	HP 8481A
10 MHz to 26.5 GHz	(-20 to 30) dBm	4.8 % of rdg	Agilent E4448A with N5532S
(26.5 to 50) GHz	(-10 to 20) dBm	7 % of rdg	HP 8487A/HP E4418B
RF Power – Generate			
10 MHz to 40 GHz	(-10 to 10) dBm	1.8 dBm	HP 83460B opt 01
10 MHz to 40 GHz	(-60 to -10) dBm	2.2 dBm	
10 MHz to 40 GHz	(-110 to -60) dBm	2.8 dBm	
1.5 MHz to 1.0 GHz	(0 to 50) W	1.8 mW	ENI 550 Amp, ENI 6100L Amp & HP 8482A

Electrical – RF/Microwave

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Amplitude Modulation[3] – Measure 100 kHz to 10 MHz 10 MHz to 3 GHz 10 MHz to 3 GHz (3 to 26.5) GHz (3 to 26.5) GHz (26.5 to 31.5) GHz (26.5 to 31.5) GHz (31.5 to 50) GHz (31.5 to 50) GHz	 (5 to 99) %Depth (5 to 20) %%Depth (20 to 99) %Depth (5 to 20) %Depth (20 to 99) % Depth (5 to 20) % Depth (20 to 99) % Depth (5 to 20) % Depth (20 to 99) % Depth	 1 % Depth 2.9 % Depth 0.82 % Depth 5.2 % Depth 1.8 % Depth 7.9 % Depth 2.3 % Depth 30 % Depth 7 % Depth	Agilent E4448A with N5532S
Frequency Modulation[3] – Measure 250 kHz to 10 MHz 10 MHz to 6.6 GHz (6.6 to 13.2) GHz (13.2 to 31.15) GHz (31.15 to 50) GHz	 20 Hz to 10 kHz (50 to 200) Hz	 1.8 % 1.8 % 2.9 % 4.4 % 9.8 %	Agilent E4448A with N5532S
Phase Modulation[3] –	100 kHz to 50 GHz	3.5 %	Agilent E4448A with N5532S
Audio Distortion	400 Hz and 1 kHz	5.8 %	HP 8902A
Amplitude Modulation Distortion[3] – Measure	(0.1 to 10) MHz 10 MHz to 26.5 GHz (26.5 to 50) GHz	1.1 % 1.3 % 7.2 %	Agilent E4448A with N5532S
Frequency Modulation Distortion[3] – Measure	1 MHz to 50 GHz	0.67 %	Agilent E4448A with N5532S
Harmonic Distortion 20 Hz to 20 kHz 20 kHz to 50 GHz	(-120 to 0) dB	1.7 dB 0.91 dB	HP 8903A Agilent E4448A with N5532S
Power Meters[3]	3 μW to 100 mW	0.3 % of rdg	HP 11683A

Mechanical

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Scales & Balances[2,3]	(1 to 20) g (20 to 200) g Up to 450 lb	0.084 mg + 0.6*R* 0.67 mg + 0.6*R* 8.5 g + 0.6*R*	Class 1 weights Class F weights
Low Pressure – Measure[3]	(0 to 23) psia (0 to 7) psig	0.02 psia 0.006 psig	Paroscientific 760-23A
Pressure Gauges[3]	(5 to 15 000) psi	0.04 % of rdg	Ametek type T
Vacuum Gages	(0 to 30) inHg	0.075 inHg	Paroscientific 760-23A

Mechanical

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Torque Wrenches[3]	(4 to 1 000) lbf·in (25 to 1 000) lbf·ft	0.4 % 0.49 %	CDI torque system
Torque Analyzers	Up to 250 lbf·ft	0.11 %	Weights and arm
Force Gages – Tension & Compression[3]	10 mgf to 540 lbf	0.06 % of rdg	Class 1 and Class F weights
Mass – Class F	(5 to 225) g (2 to 10) lb (25 to 50) lb	0.49 mg 0.028 g 0.3 g	Master balances
Indirect Verification of Rockwell Hardness Testers[3]	(20 to 69) HRA (70 to 79) HRA (80 to 86) HRA (0 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW (20 to 39) HRC (40 to 59) HRC (60 to 70) HRC	1.3 HRA 1.3 HRA 0.73 HRA 1.9 HRBW 1.3 HRBW 1.3 HRBW 1.3 HRC 1.3 HRC 0.73 HRC	Hardness blocks
Direct Verification of Durometers – Scale Accuracy Type A, B, C, D, M Indenter Geometry Length Diameter Angle	 (0 to 100) duros 0.1 in 0.05 in (30 to 35) °	 0.01 duros 340 µin 340 µin 0.085 °	 Master balance Optical comparator

Thermodynamic

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Temperature – Measure[3]	(-200 to 600) ºC	0.025 °C	Hart 1502 with Fluke 5628
Temperature – Measuring Equipment	(-25 to 0) °C (0 to 350) ºC	0.16 °C 0.14 °C	Hart 1502 with Fluke 5628 and dry block
Humidity – Measure[3]	(0 to 90) % RH	1.7 % RH	Vaisala HM141/HMP46
IR Thermometry[3]	(Ambient to 100) ºC (100 to 300) ºC (300 to 500) ºC	0.68 ºC 0.85 ºC 1 ºC	Fluke 9132

Time and Frequency

Parameter/ Equipment	Range	Calibration and Measurement Capability [Expressed as Uncertainty (±)]	Reference Standard or Equipment
Frequency – Measuring Equipment[3]	100 MHz to 40 GHz	2.3 parts in 10^9	HP 83640B
Frequency – Measure	10 MHz	1 part in 10^{11}	HP 58503A
Frequency – Measure[3]	10 Hz to 46 GHz	1.2 parts in 10^8	HP 53152A

Notes:
1. Calibration and Measurement Capabilities (Expanded Uncertainties) are based on approximately a 95% confidence interval, using a coverage of k=2.
2. *L* = length in inches, *D* = diameter in inches, *t* = time in seconds, *T* = temperature in degree C, *R* = resolution of the device under test.
3. This laboratory offers field calibration services.
4. % = percent of reading unless otherwise indicated.
5. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2080.01

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