



CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

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

This is to certify that

The Tool & Gage House
538 E. Hebron St.
Charlotte, NC 28273

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

ISO/IEC 17025:2005

while demonstrating technical competence in the fields of

CALIBRATION AND TESTING

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

L1050-1

Certificate Number



ANAB Approval

Certificate Valid: 05/16/2018-02/18/2019
Version No. 004 Issued: 05/16/2018



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

The Tool & Gage House

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 Charlotte, NC 28273
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CALIBRATION AND TESTING

Valid to: **February 18, 2019**

Certificate Number: **L1050-1**

Calibration

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Fixed Capacitance @ 1 kHz	0.001 μ F 0.01 μ F 0.1 μ F 1 μ F	1.6 pF 6 pF 0.14 nF 1.4 nF	Comparison to Standard Capacitors
Capacitance Source ¹	(0.2 to 3.29) nF (3.3 to 329) nF (0.3 to 3.29) μ F (3.3 to 32.9) μ F (33 to 300) μ F (0.3 to 3.29) mF (3.3 to 30) mF (33 to 110) mF	0.013 nF + 0.025 nF/nF 0.04 nF+ 0.004 4 nF/nF 0.000 97 μ F + 0.004 2 μ F/ μ F 4 nF + 6 nF/ μ F 78 nF + 6.5 nF/ μ F 0.32 μ F + 8.3 μ F/mF 12 μ F/mF 190 μ F + 17 μ F/mF	Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
DC Current Source ¹	(0 to 329) μ A (0 to 3.29) mA (0 to 32.9) mA (0 to 329) mA (0 to 2.99) A (0 to 10.9) A (11 to 20) A	0.033 μ A + 0.000 15 μ A/ μ A 0.66 μ A + 0.16 μ A/mA 3.9 μ A + 28 μ A/mA 23 μ A + 0.075 μ A/mA 1.1mA + 0.22 mA/A 12 mA + 0.19 mA/A 1.5 mA/A	Comparisons with a Multifunction Calibrator Fluke 5520A/5522A w/ each range locked



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current Source ¹ (Sine Wave) (0.045 to 30) kHz	(33 to 329) μ A		Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
	45 Hz to 1kHz	0.6 μ A + 0.0013 μ A/ μ A	
	1kHz to 10 kHz	0.61 μ A + 0.015 μ A/ μ A	
	10 kHz to 30 kHz	0.73 μ A + 0.023 μ A/ μ A	
	(0.33 to 3.29) mA		
	45 Hz to 1kHz	1.5 μ A + 1.1 μ A/mA	
	1kHz to 10 kHz	1.8 μ A + 13 μ A/mA	
	10 kHz to 30 kHz	0.87 μ A + 18 μ A/mA	
	(3.3 to 32.9) mA		
	45 Hz to 1kHz	5.5 μ A + 1.2 μ A/mA	
	1kHz to 10 kHz	6.5 μ A + 8.4 μ A/mA	
	10 kHz to 30 kHz	2.5 μ A + 12 μ A/mA	
AC Current Source ¹ (Sine Wave) (0.045 to 5 kHz)	(33 to 329) mA		Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
	45 Hz to 1kHz	64 μ A + 0.48 μ A/mA	
	1kHz to 10 kHz	130 μ A + 2.6 μ A/mA	
	10 kHz to 30 kHz	210 μ A + 8.2 μ A/mA	
	(0.33 to 1.09) A		
	45 Hz to 1kHz	0.58 mA + 0.98 mA/A	
	1kHz to 5 kHz	1.1 mA + 13 mA/A	
	5 kHz to 10 kHz	5.2 mA + 37 mA/A	
	(1.1 to 2.9) A		
	45 Hz to 1kHz	0.55 mA + 1.1 mA/A	
	1kHz to 5 kHz	1.1 mA + 13 mA/A	
	5 kHz to 10 kHz	5 mA + 37 mA/A	
AC Current Source ¹ (Sine Wave) (0.045 to 5 kHz)	(3 to 10.9) A		Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
	45 Hz to 100 Hz	4.1 mA + 2.4 mA/A	
	100 Hz to 1 kHz	4.1 mA + 1.6 mA/A	
	1 kHz to 5 kHz	2.7 mA + 36 mA/A	
	(11 to 20) A		
	45 Hz to 100 Hz	110 mA + 0.49 mA/A	
AC Current Clamp-On Meter ¹ (45 Hz to 65 Hz) (65 Hz to 400 Hz)	(20 to 1 000) A	1.5 A + 3.7 mA/A	Comparison to a Multifunction Calibrator FLUKE 5520A/5522A and 50 Turn Coil
	(20 to 1 000) A	1.5 A + 5.9 mA/A	
DC Current Clamp-On Meter ¹	(20 to 1 000) A	820 mA + 3 mA/A	
DC Current (Measure) ¹	(0 to 100) mA	64 μ A + 0.006 4 μ A/ μ A	Utilizing a DMM



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current (Measure) ¹	(0 to 100) mA		Utilizing a DMM
	10 Hz	0.1 μ A + 4.6 μ A/ μ A	
	5 kHz	0.14 μ A + 1.8 μ A/ μ A	
	10 kHz	0.22 μ A + 5.3 μ A/ μ A	
	(100 mA to 1 A)		
	10 Hz	4.1 μ A/ μ A	
	5 kHz	2.1 μ A/ μ A	
	10 kHz	14 μ A/ μ A	
	(1 A to 10 A)		
45 Hz	2.7 mA/A		
1 kHz	2.6 mA/A		
Fixed Inductance 1 kHz	100 μ H	0.74 μ H	Comparison to Standard Inductors
	1 mH	2.4 μ H	
	10 mH	0.02 mH	
	100 mH	0.23 mH	
Fixed Resistance	1 Ω	970 $\mu\Omega$	Comparison to Standard Resistors
	10 Ω	0.66 m Ω	
	100 Ω	1.6 m Ω	
	1 k Ω	1.6 m Ω	
	10 k Ω	0.48 Ω	
100 k Ω	1.1 Ω		
Resistance Source ¹	(0 to 10.9) Ω	1.2 m Ω + 47 μ Ω / Ω	Comparison performed with Multifunction Calibrator Fluke 5520A/5522A
	(11 to 32.9) Ω	33 m Ω + 0.6 m Ω / Ω	
	(33 to 109) Ω	40 m Ω + 16 $\mu\Omega$ / Ω	
	(0.11 to 1.1) k Ω	0.11 m Ω + 61 $\mu\Omega$ /k Ω	
	(1.2 to 10.9) k Ω	54 m Ω + 31 $\mu\Omega$ /k Ω	
	(11 to 109) k Ω	0.23 Ω + 33 Ω /k Ω	
	(0.110 to 1.09) M Ω	1.7 Ω + 43 m Ω /k Ω	
	(1.1 to 3.29) M Ω	4.1 Ω + 0.1 k Ω /M Ω	
	(3.3 to 10.9) M Ω	190 Ω /M Ω	
	(11 to 32.9) M Ω	0.7 k Ω + 0.49 k Ω /M Ω	
	(33 to 109) M Ω	1 k Ω + 720 Ω /M Ω	
	(110 to 329) M Ω	0.84 M Ω + 0.002 3 M Ω /M Ω	
	(0.33 to 1.1) G Ω	0.55 M Ω + 0.018 M Ω /M Ω	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance Measure ¹	(0 to 10) Ω (10 to 1 000) Ω (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ	240 μΩ + 130 μΩ/Ω 630 μΩ + 14 μΩ/Ω 5.3 mΩ + 15 mΩ/kΩ 71 mΩ + 14 mΩ/kΩ 2.3 Ω + 20 Ω/ MΩ 21 Ω + 230 Ω/MΩ	Utilizing an 8½ DMM with High Stability Option
	(10 to 100) MΩ (0.1 to 1) GΩ	11 kΩ/MΩ 0.2 MΩ + 0.025 MΩ/MΩ	
DC Voltage Source ¹	(0.01 to 329) mV (0.33 to 3.29) V (3.3 to 32.9) V (33 to 329.9) V (330 to 1 000) V	7.1 μV + 0.013 μV/ mV 68 μV + 4.9 μV/ V 0.67 mV + 8.1 μV/V 23 mV + 5 μV/V 21 mV + 12 μV/V	Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
AC Volt Source ¹ (Sine Wave) (0.045 to 450) kHz	(0.001 to 33) mV 45 Hz to 10 kHz 10 kHz to 450 kHz	100 μV + 0.91 μV/mV 100 μV + 0.98 μV/mV	
	(33 to 330) mV 45 Hz to 10 kHz 10 kHz to 450 kHz (0.33 to 3) V 45 Hz to 10 kHz 10 kHz to 450 kHz	93 μV + 0.94 μV/mV 520 μV + 2.2 μV/ mV 0.86 mV + 0.68 mV/V 1.1 mV + 3.6 mV/ V	
AC Volt Source ¹ (Sine Wave) (0.045 to 90) kHz	(3 to 30) V 45 Hz to 10 kHz 10 kHz to 90 kHz	2.8 mV + 0.44 mV/V 2.6 mV + 5.9 mV/V	
AC Volt Source ¹ (Sine Wave) (0.045 to 50) kHz	(30 to 330) V 45 Hz to 10 kHz 50 kHz	12 mV + 1.7 mV/V 12 mV + 9.2 mV/V	Comparisons performed with a Multifunction Calibrator Fluke 5520A/5522A
AC Volt Source ¹ (Sine Wave) (0.045 to 8) kHz	(330 to 1 000) V 45 Hz to 1kHz 1 kHz to 10 kHz	36 mV + 1.8 mV/V 37 mV + 0.88 mV/V	
DC Voltage Measure ¹	(0 to 100) mV (0.1 to 10) V (10 to 100) V (100 to 1 000) V	4.7 μV + 0.17 μV/mV 83 μV + 2.9 μV/V 0.73 μV + 4.6 μV/V 9 mV + 74 μV/V	Utilizing an DMM with High Stability Option
	(1 000 to 20 000) V	3.9 V/kV	Utilizing a High Voltage Meter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage Measure ¹ (0.045 to 20) kHz	0 to 100 mV 0.1 V to 10 V 10 V to 100 V 100 V to 1000 V	0.051 mV + 0.68 μV/mV 0.32 mV + 1 mV/V 3.2 mV + 1.1 mV/V 0.35 V + 0.73 mV/V	Utilizing an DMM
AC Voltage Measure ¹ (0.045 to 20) kHz	(1 000 to 20 000) V	6.2 V/kV	Utilizing a High Voltage Meter
Thermocouple Simulation ¹	Type J (-200 to -100) °C (-100 to 150) °C (150 to 760) °C (760 to 1 200) °C Type K (-200 to -100) °C (-100 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C Type R (0 to 250) °C (250 to 1 000) °C (1 000 to 1 767) °C Type S (0 to 250) °C (250 to 1 400) °C (1 400 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.39 °C 0.2 °C 0.23 °C 0.27 °C 0.44 °C 0.23 °C 0.36 °C 0.5 °C 0.88 °C 0.45 °C 0.53 °C 0.68 °C 0.46 °C 0.6 °C 1.5 °C 0.56 °C 0.39 °C 0.33 °C	Multifunction Calibrator Fluke 5520A/5522A
RTD Simulation ¹	(-200 to -80) °C (-80 to 0) °C (0 to 400) °C (400 to 630) °C (630 to 800) °C	0.13 °C 0.17 °C 0.14 °C 0.16 °C 0.29 °C	Multifunction Calibrator Fluke 5520A/5522A



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks ²	(0.005 to 5) in	(7.8 + 3.8L) μin	Gage Block Comparator and Gage Blocks
	(5 to 20) in	(17 + 5.6L) μin	Single Axis Measuring Machine and Gage Blocks
Thickness Standards (Shims) ²	(0 to 0.5) in	(33 + 9.9L) μin	Single Axis Measuring Machine and Gage Blocks
Micrometer Length Standards ²	(0.1 to 20) in	(23 + 7.9L) μin	Single Axis Measuring Machine and Gage Blocks
	(20 to 40) in	(79 + 8.4L) μin	CMM utilized as a reference standard
Outside Diameter ² (Spheres & Pin/Plug Gages)	(0.005 to 12) in	(21 + 4.9L) μin	Single Axis Measuring Machine and Master Spheres/Pins/Plugs
Gear & Thread Wires	(0.005 to 1) in	(15 + 9.2L) μin	Single Axis Measuring Machine and Master plugs
Cylindrical ID ² (Ring Gages)	(0.15 to 0.32) in	(15 + 44L) μin	Single Axis Measuring Machine and Master Cylindrical Rings
	(0.6 to 8) in	(30 + 6.6L) μin	
	(8 to 30) in	(150 + 9.8L) μin	
Plain Snap Gages ^{1,2}	(0.05 to 6) in	(11 + 9.6L) μin	Gage Blocks
Thread Plugs ² Major Diameter	Up to 8 in	(52 + 6.9L) μin	Single Axis Measuring Machine and Cylindrical Plugs
	4 to 80 TPI 0.3 to 5 TPI mm	(95 + 3.9L) μin (2.41 + 0.003 9L) μm	Single Axis Measuring Machine and Thread Wires
Thread Rings ² Pitch Diameter Measure	4 to 80 TPI	(52 + 3L) μin	Single Axis Measuring Machine and with T-Probe Attachment
	4 to 80 TPI 0.3 to 5 TPI mm	N/A	Standard Set Thread Plug
Taper Thread Plug ² Pitch Diameter	(0.2 to 12) in	(93 + 6.1L) μin	Single Axis Measuring Machine and Thread Wires
Taper Thread Plug Standoff	(-0.02 to 0.02) in	375 μin	Single Axis Measuring Machine
Taper Thread Ring Pitch Diameter	(0.2 to 6) in	(85 + 5.1L) μin	Single Axis Measuring Machine and with T-Probe Attachment
Taper Thread Ring ² Ring Thickness	(0.1 to 1.14) in	(14 + 130L) μin	Single Axis Measuring Machine



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Taper Thread Ring Standoff	(-0.02 to 0.02) in	375 µin	Single Axis Measuring Machine T-Probe Attachment
Thread Snap Gage ¹ (Set to Plug)	(0.05 to 4 in)	N/A	Set Plugs
Thread Plugs Depth Notch	0 to 18 mm	30 µm 50 µm	VMM Optical Comparator
Geometric Form Out of Roundness Perpendicularity Straightness	Up to 102 mm Up to 280 mm Up to 280 mm	1.2 µm 2 µm 1.4 µm	Mahr MMQ400 Per ASME B89.3.1
Surface Finish Standards	Ra: up to 100 mm	(0.06 µm + 0.1 µm/µm)	Profilometer ASME B46.1
Profilometer	0.4 to 3 µm	Ra: 0.033 µm + 0.15 µm	Using Surface Specimen
	Length up to 100 mm Diameter Straightness	1.6 µm 1.8 µm 1.1 µm	Using Gage Blocks Sphere Optical Flat
Fixtures and Gaging ²	X = (0 to 36) in Y = (0 to 40) in Z = (0 to 24) in	(160 + 8.8L) µin	Coordinate Measuring Machine
Dial & Digital Indicators ^{1,2}	(0 to 1) in	(29 + 40L) µin	Indicator Calibrator
Indicator's (Probes & LVDT's) ²	(0 to 4) in	(27 + 3.4L) µin	Single Axis Measuring Machine
Calipers (OD and ID) ^{1,2}	(0 to 12) in (12 to 80) in	(640 + 1L) µin (520 + 11L) µin	Gage Blocks
Outside Micrometers ^{1,2}	(0 to 40) in	(47 + 16L) µin	Gage Blocks
Inside Micrometers ^{1,2}	(0 to 80) in	(94 + 6.4L) µin	Gage Blocks
Bore Gages ^{1,2} (Indicator Type)	(0 to 1) in	(62 + 14L) µin	Indicator Calibrator/ SAMM
Depth Micrometers ^{1,2}	(0 to 20) in	(280 + 24L) µin	Gage Blocks
Height and Depth Gages ^{1,2}	(0 to 40) in	(640 + 4.5L) µin	Gage Blocks
Single Axis Measuring Machine ^{1,2}	(0 to 20) in (20 to 60 in)	(8.2 + 5.3L) µin (89 + 8.9L) µin	Gage Blocks

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Radius Gage ²	Up to 1 in Up to 13 mm	$(170 + 8.2L) \mu\text{in}$ $(4.3 + 0.008 2l) \mu\text{m}$	Video Measuring Machine
Bubble Level (0 to 20) in	(0 to 0.02) in	150 μin	Surface Plate
Protractor	(0 to 35) °	0.12 °	Surface Plate, Sine Bar/Plate, Gage Blocks
	90 °	0.099 °	Cylindrical Square, Surface Plate
	(0 to 180) °	0.055 °	VMM
Optical Comparators ^{1,2} Length	(0 to 12) in	$(170 + 5.5L) \mu\text{in}$	Glass Scale
Magnification	10 X 20 X 31.25 X 50 X 62.5 X 100 X	226 μin 222 μin 175 μin 170 μin 178 μin 140 μin	Magnification Scale
Bore Micrometers (3pt) ²	(0 to 7) in	$(74 + 12L) \mu\text{in}$	Master Rings
Measuring Microscope ^{1,2}	(0 to 12) in	$(140 + 1.3L) \mu\text{in}$	Glass Scale
Coordinate Measuring Machines ^{1,2}			DIN VDI/VDE 2617-1 1986, VDI/VDE 2617-3 1989
Linearity (X, Y, Z axis)	(0 to 40) in	$(17 + 7.7L) \mu\text{in}$	Gage Blocks
Volumetric / Spatial Error	(0 to 40) in	$(17 + 8.7L) \mu\text{in}$	Gage Blocks
Probing Error	(0 to 8) in	20 μin	Sphere
Squareness	(0 to 8) in	107 μin	Master Square
Video Measuring Machines ^{1,2}	X/Y (0 to 12) in Z (0 to 8) in	$(100 + 1.7L) \mu\text{in}$ 550 μin	Glass Scales & Gage Blocks
	Angle	0.05°	Glass Scale & with Angle Reference

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Coating Thickness Gages	Up to 0.2 in	(0.000 04 + 0.011L) in	Thickness foils

Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force (Tension only)	0 to 500 lbf	0.003 lbf + 0.000 46 lbf/lbf	Weights & Hanger
Brinell Hardness Testers ¹	Low High	1.8 HBW 2.3 HBW	ASTM E-10 Indirect Verification with Test Blocks
Vickers Hardness Testers ¹	(240 to 600) HV Over 600 HV	3.8 HV 8 HV	ASTM E-384 Indirect Verification with Test Blocks
Knoop Hardness Testers ¹	(250 to 650) HK Over 650 HK	4.7 HK 9.1 HK	ASTM E-384 Indirect Verification with Test Blocks
Leeb Hardness Testers ¹	Low High	10 HLD 14 HLD	ASTM-A956 Indirect Verification with Test Blocks
Durometer: Force	(0.1 to 45) N	0.014 N + 0.005 2 N/N	ASTM D2240 Except Orifice size Weights
Indenter Angle Radius / Length / Width	Up to 45° Up to 0.5 in	0.05° (290 + 0.8L) μin	Optical Comparator



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Rockwell Hardness Testers ¹	HRA		ASTM E-18 Indirect Verification with Test Blocks	
		Low		1.3 HRA
		Mid		1.2 HRA
		High		0.7 HRA
	HRBW			
		Low		1.4 HRBW
		Mid		1.4 HRBW
		High		1.3 HRBW
	HRC			
		Low		1.2 HRC
		Mid		1.2 HRC
		High		0.7 HRC
	HREW			
		Low		1.3 HREW
		Mid		1.3 HREW
	High	1 HREW		
HRFW				
	Low	1.3 HRFW		
	Mid	1.3 HRFW		
	High	1 HRFW		



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	HR15N		ASTM E-18 Indirect Verification with Test Blocks
	Low	1.3 HR15N	
	Mid	1.2 HR15N	
	High	0.7 HR15N	
	HR15T		
	Low	1.3 HR15T	
	Mid	1.4 HR15T	
	High	1 HR15T	
	HR30N		
	Low	1.3 HR30N	
	Mid	1.3 HR30N	
	High	1 HR30N	
	HR30T		
	Low	1.8 HR30T	
Mid	1.3 HR30T		
High	1.3 HR30T		
HR45N			
Low	1.3 HR45N		
Mid	1.3 HR45N		
High	1 HR45N		
HR45T			
Low	1.8 HR45T		
Mid	1.3 HR45T		
High	1.3 HR45T		
Hydraulic Pressure	(0 to 10 000) psig	2 psi + 0.0011 psi/psi	Deadweight Tester
Pneumatic / Hydraulic Pressure ¹	(0 to 1 500) psig	0.69 psi + 0.001 9 psi/psi	Pressure Modules
	(0 to 5 000) psig	3.2 psi + 0.000 75 psi/psi	
Barometric Pressure	(0.98 to 1.05) bar	4 mbar	Compared to Barometer
Vacuum ¹	(-14 to 0) psig	0.011 psi + 0.000 4 psi/psi	Vacuum / Pressure Module
Torque Analyzers / Testers	(10 to 100) lbf-in	0.87 lbf-in + 0.02 lbf-in / lbf-in	Torque Arms with Weights
	(2 to 1 500) lbf-ft	0.012 lbf-ft + 0.001 5 lbf-ft / lbf-ft	
Torque Wrenches, Drivers, Watches ¹	(10 to 100) lbf-in	0.89 lbf-in + 0.021 lbf-in / lbf-in	Transducers with wrench Loader
	(5 to 1 500) lbf-ft	0.13 lbf-ft + 0.003 3 lbf-ft / lbf-ft	



Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Infrared Thermometers	(25 to 500) °C	2.3 °C + 0.002 9 °C/°C	Blackbody w / PRT
Relative Humidity ¹ (Measurement)	(30 to 50) %RH	(0.57 + 0.025R) %RH	Temperature & Humidity Probe
Temperature & Humidity meter ¹	18 °C to 25°C	0.65°C	Temperature & Humidity Probe
Relative Humidity ¹ (Source)	11.3 %RH 33.1 %RH 75.5 %RH 97.5 %RH	2.1 %RH 2.1 %RH 2.5 %RH 3.7 %RH	Aqueous Salt Solutions with Digital Tem/Humidity Probe
Thermometers ¹	(0 to 500) °C	0.5 °C	PRT Thermometer with Drywell

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Source ¹ (Leveled Sine-Wave)	5 Hz to 119 Hz 120 Hz to 1 kHz 1 to 120 kHz	0.95 mHz + 0.007 8 mHz / Hz 1 mHz + 0.006 4 mHz / Hz 6.5 mHz / kHz	Comparison to a Multifunction Calibrator Fluke 5520A/5522A and Monitored with a Frequency Counter
Frequency Measure ¹	5 Hz to 1 MHz	0.009 1 Hz + 0.26 mHz/Hz	Comparison to a Universal Counter
Stopwatch & Timers ¹	1 sec to 3 600 sec	0.087 sec + 0.000 013 sec/sec	Comparison to a Universal Counter
Tachometer	Up to 100 000 rpm	1.2 rpm + 0.000 014 rpm/rpm	Multifunction Calibrator / Universal Counter
Frequency Measure ¹	5 Hz to 1 MHz	0.009 1 Hz + 0.26 mHz/Hz	Comparison to a Universal Counter



Testing

Dimensional Measurement

Specific Tests and / or Properties Measured	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dimensional Measurement (Mechanical Inspection and Testing) ²	X = (0 to 6) in Y = (0 to 6) in	(180 + 10L) μin	Video probe utilized as Reference Standard for Dimensional Inspection
Dimensional Measurement (Mechanical Inspection and Testing) (Volumetric) ²	X = (0 to 36) in Y = (0 to 47) in Z = (0 to 24) in	(160 + 8.8L) μin	Coordinate Measuring Machine utilized as Reference Standard for Dimensional Inspection

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, l = length in millimeters, R = relative humidity in %RH
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L1050-1.



Vice President

