



CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board

11617 Coldwater Road, Fort Wayne, IN 46845 USA

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 17025:2017

while demonstrating technical competence in the fields of

CALIBRATION AND DIMENSIONAL MEASUREMENT

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

L1050-1

Certificate Number



ANAB Approval

Certificate Valid Through: 02/18/2021
Version No. 007 Issued: 03/19/2020



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. 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 17025:2017

The Tool & Gage House

538 E. Hebron St.
Charlotte, NC 28273
Aysegul Konu 704-285-7067

CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: February 18, 2021

Certificate Number: L1050-1

CALIBRATION

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Source ¹	(0.2 to 3.29) nF (3.3 to 329) nF (0.3 to 3.29) μF (3.3 to 32.9) μF (33 to 300) μF (0.3 to 3.29) mF (3.3 to 30) mF (33 to 110) mF	9.6 pF + 5.2 pF/nF 4 pF+ 5.5 pF/nF 0.66 nF + 3 nF/μF 1.9 nF + 4 nF/μF 0.12 μF + 3.9 nF/μF 0.33 μF + 5.7 μF/mF 6.2 μF+ 7.6 μF/mF 94 μF + 8.7 μF/mF	Comparisons performed with a Multifunction Calibrator
DC Current Source ¹	(0 to 329) μA (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	21 nA + 0.11 nA/μA 0.04 μA + 0.18 μA/mA 0.2 μA + 0.079 μA/mA 1.9 μA + 0.082 μA/mA 24 μA + 0.31 mA/A 0.38 mA + 0.4 mA/A 0.33 mA+ 0.8 mA/A	Comparisons with a Multifunction Calibrator
AC Current Source ¹ (Sine Wave) (0.045 to 30) kHz	(33 to 329) μA 45 Hz to 1kHz 1kHz to 10 kHz 10 kHz to 30 kHz (0.33 to 3.29) mA 45 Hz to 1kHz 1kHz to 10 kHz 10 kHz to 30 kHz	0.11 μA + 0.001 1 μA/μA 0.16 μA + 0.006 2 μA/μA 0.31 μA + 0.012 μA/μA 0.08 μA + 1.1 μA/mA 0.33 μA + 3.8 μA/mA 0.57 μA + 7.5 μA/mA	Comparisons performed with a Multifunction Calibrator



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	(3.3 to 32.9) mA 45 Hz to 1kHz 1kHz to 10 kHz 10 kHz to 30 kHz (33 to 329) mA 45 Hz to 1kHz 1kHz to 10 kHz 10 kHz to 30 kHz	1.3 μ A + 0.69 μ A/mA 2.2 μ A + 1.7 μ A/mA 3.0 μ A + 3.2 μ A/mA 9.1 μ A + 0.81 μ A/mA 75 μ A + 1.7 μ A/mA 150 μ A + 3.2 μ A/mA	Comparisons performed with a Multifunction Calibrator
AC Current Source ¹ (Sine Wave) (0.045 to 10 kHz)	(0.33 to 1.09) A 45 Hz to 1kHz 1kHz to 5 kHz 5 kHz to 10 kHz (1.1 to 2.9) A 45 Hz to 1kHz 1kHz to 5 kHz 5 kHz to 10 kHz (3 to 10.9) A 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz (11 to 20) A 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 10 kHz	0.16 mA + 0.75 mA/A 0.67 mA + 6.2 mA/A 3.8 mA + 20 mA/A 14 μ A + 0.91 mA/A 3.0 mA + 4 mA/A 3.5 mA + 20 mA/A 0.82 mA + 1.2 mA/A 0.98 mA + 1.2mA/A 1.9 mA + 24 mA/A 16 mA + 3.1 mA/A 30 mA + 3.8 mA/A 23 mA + 23 mA/A	Comparisons performed with a Multifunction Calibrator
AC Current Clamp-On Meter ¹ (45 Hz to 65 Hz) (65 Hz to 100 Hz)	(20 to 1 000) A (20 to 1 000) A	90 mA + 2.2 mA/A 140 mA + 4.7 mA/A	Comparison to a Multifunction Calibrator and 50 Turn Coil
DC Current Clamp-On Meter ¹	(20 to 1 000) A	130 mA + 1.8 mA/A	
DC Current (Measure) ¹	(0 to 100) mA (0.1 to 2) A	2.5 μ A + 0.62 μ A/mA 82 μ A + 1.5 mA/A	Utilizing a DMM
AC Current (Measure) ¹	(0 to 100) mA 10 Hz to 1 kHz 100 mA to 1 A 10 Hz to 1 kHz (1 to 10) A 45 Hz; 1 kHz	0.093 μ A + 2.6 μ A/mA 0.48 mA + 1.2 μ A/mA 1.7 mA + 2.3 mA/A	Utilizing a DMM



ANSI National Accreditation Board

Electrical – DC/Low Frequency

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Capacitance (Measure) ¹	(0.4 to 1) nF (1.0 to 10) nF (10 to 100) nF 100 nF to 1 μF (1 to 100) μF 100 μF to 10 mF (10 to 100) mF	31 pF + 22 pF/ nF 40 pF + 14 pF/ nF 0.58 nF + 0.012 nF/ nF 0.02 nF + 0.018 nF/nF 12 nF + 17 nF/μF 7.5 μF + 17 μF/mF 0.23 mF + 0.047 mF/mF	Utilizing a DMM
Resistance Source ¹	(0 to 10.9) Ω (11 to 32.9) Ω (33 to 109) Ω (0.11 to 1.1) kΩ (1.2 to 10.9) kΩ (11 to 109) kΩ (0.110 to 1.09) MΩ (1.1 to 3.29) MΩ (3.3 to 10.9) MΩ (11 to 32.9) MΩ (33 to 109) MΩ (110 to 329) MΩ (0.33 to 1.1) GΩ	0.95 mΩ + 31 μΩ/Ω 2.9 mΩ + 2.2 μΩ/Ω 3.1 mΩ + 19 μΩ/Ω 2.8 mΩ + 22 μΩ/Ω 44 mΩ + 21 μΩ/Ω 0.15 Ω + 23 mΩ/kΩ 1 Ω + 31 mΩ/kΩ 33 Ω + 85 Ω/MΩ 0.05 kΩ + 120 Ω/MΩ 1.8 kΩ + 0.43 kΩ/MΩ 2 kΩ + 530 Ω/MΩ 0.76 MΩ + 2.4 kΩ/MΩ 0.45 MΩ + 0.012 MΩ/MΩ	Comparison performed with Multifunction Calibrator
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	140 μΩ + 270 μΩ/Ω 610 μΩ + 14 μΩ/Ω 5.2 mΩ + 15 mΩ/kΩ 76 mΩ + 14 mΩ/kΩ 2.3 Ω + 21 Ω/ MΩ 0.15 kΩ + 0.11 kΩ/MΩ	Utilizing an 8½ DMM with High Stability Option
	(10 to 100) MΩ (0.1 to 1) GΩ	0.91 kΩ + 0.67 kΩ/MΩ 0.26 MΩ + 0.026 MΩ/MΩ	Utilizing an 6½ DMM
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	3.2 μV + 0.016 μV/ mV 3.5 μV + 11 μV/ V 36 μV + 15 μV/V 0.17 mV + 16 μV/V 1.6 mV + 14 μV/V	Comparisons performed with a Multifunction Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Volt Source ¹ (Sine Wave) (0.045 to 450) kHz	(0.001 to 33) mV 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 450 kHz	9.1 μV + 0.0061 μV/mV 5.7 μV + 0.1 μV/mV 39 μV + 6.2 μV/mV	Comparisons performed with a Multifunction Calibrator
	(33 to 330) mV 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 450 kHz	6.6 μV + 0.12 μV/mV 6.6 μV + 0.12 μV/mV 57 μV + 1.6 μV/mV	
	(0.33 to 3) V 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 450 kHz	54 μV + 13 μV/V 75 μV + 110 μV/V 0.52 mV + 1.9 mV/V	
	(3 to 30) V 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 90 kHz	0.48 mV + 0.12 mV/V 0.46 mV + 0.13 mV/V 1.3 mV + 0.7 mV/V	
AC Volt Source ¹ (Sine Wave) (0.045 to 50) kHz	(30 to 330) V 45 Hz to 1 kHz 1 kHz to 10 kHz 10 kHz to 50 kHz	0.7 mV + 0.18 mV/V 5.3 mV + 0.16 mV/V 4.1 mV + 0.25 mV/V	Comparisons performed with a Multifunction Calibrator
	(330 to 1 000) V 45 Hz to 1kHz 1 kHz to 10 kHz	24 mV + 0.2 mV/V 8.2 mV + 0.23 mV/V	
DC Voltage Measure ¹	(0 to 100) mV (0.1 to 10) V (10 to 100) V (100 to 1 000) V	4.3 μV + 0.071 μV/mV 81 μV + 30 μV/V 720 μV + 48 μV/V 12 mV + 49 μV/V	Utilizing an DMM with High Stability Option
	(0 to 1 000) V (1 000 to 20 000) V	48 mV + 0.75 mV/V 1.2 V + 1.3 V/kV	Utilizing a High Voltage Meter & Probe
AC Voltage Measure ¹ (50 /60) Hz	10 mV to 10 V 10 V to 500 V	41 μV + 1.3 mV/V 29 mV + 1.4 mV/V	Utilizing an DMM
AC Voltage Measure ¹ (50 /60) Hz	(1 000 to 9 000) V (9000 to 30 000) V	94 μV + 2 V/kV 8.3 V + 1.1 V/kV	Utilizing a High Voltage Meter & Probe

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple Simulation ¹	Type J (-200 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C Type K (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1 000 to 1 372) °C Type R (0 to 250) °C (250 to 400) °C (400 to 1 000) °C (1 000 to 1 767) °C Type S (0 to 250) °C (250 to 1 000) °C (1000 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	0.35 °C 0.16 °C 0.16 °C 0.16 °C 0.19 °C 0.34 °C 0.18 °C 0.16 °C 0.26 °C 0.34 °C 0.71 °C 0.3 °C 0.38 °C 0.38 °C 0.48 °C 0.33 °C 0.34 °C 0.43 °C 0.68 °C 0.2 °C 0.2 °C 0.15 °C	Multifunction Calibrator
RTD Simulation ¹	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 630) °C (630 to 800) °C	0.16 °C 0.17 °C 0.19 °C 0.15 °C 0.18 °C 0.26 °C	Multifunction Calibrator

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks ²	(0.005 to 5) in	(7.6 + 3.7L) μin	Gage Block Comparator and Gage Blocks
Gage Blocks ²	(5 to 20) in	(19 + 3.7L) μin	Single Axis Measuring Machine and Gage Blocks
Thickness Standards (Shims) ²	(0 to 0.5) in	(22 + 24L) μin	Single Axis Measuring Machine and Gage Blocks
Micrometer Length Standards ²	(0.1 to 20) in	(18 + 5.9L) μin	Single Axis Measuring Machine and Gage Blocks
	(20 to 40) in	(160 + 4.9L) μin	CMM utilized as a reference standard
Outside Diameter ² (Spheres & Pin/Plug Gages)	(0.005 to 2) in	(25 + 2.2L) μin	Single Axis Measuring Machine and Master Spheres/Pins/Plugs
	(2 to 12) in	(17 + 6.1L) μin	
Gear & Thread Wires	(0.005 to 1) in (TPI 4 to 80)	17 μin	Single Axis Measuring Machine and Master plugs
Cylindrical ID ² (Ring Gages)	(up to 0.32) in	(18 + 22L) μin	Single Axis Measuring Machine and Master Cylindrical Rings
	(0.3 to 10) in	(27 + 2.2L) μin	
	(9 to 16) in	(86 + 6.8L) μin	CMM utilized as a reference standard
Plain Snap Gages ^{1,2}	(up to 8) in	(7.0 + 8.9L) μin	Gage Blocks
Thread Plugs ² Major Diameter	Up to 9 in	(38 + 3.5L) μin	Single Axis Measuring Machine and Cylindrical Plugs
	4 to 80 TPI 0.3 to 5 TPI mm	95 μin 2.5 μm	Single Axis Measuring Machine and Thread Wires
Thread Rings ² Pitch Diameter Measure	4 to 80 TPI 0.3 to 5 TPI mm	55 μin 1.5 μm	Single Axis Measuring Machine and with T-Probe Attachment
	4 to 80 TPI 0.3 to 5 TPI mm	N/A	
Taper Thread Plug ² Pitch Diameter	(0.2 to 12) in	100 μin	Single Axis Measuring Machine and Thread Wires
Taper Thread Plug / Ring Standoff	(-0.02 to 0.02) in	375 μin	Single Axis Measuring Machine

Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Taper Thread Ring Pitch Diameter	(0.2 to 6 in)	75 µin	Single Axis Measuring Machine and with T-Probe Attachment
Taper Thread Ring ² Ring Thickness	(0.1 to 1.14) in	18 µin	Single Axis Measuring Machine
Thread Snap Gage ¹ (Set to Plug)	(0.05 to 4 in)	N/A	Set Plugs
Thread Plugs Depth Notch	0 to 30 mm	15 µm 25 µm	VMM Optical Comparator
Geometric Form Out of Roundness Cylindricity Perpendicularity Straightness	Up to 102 mm Up to 100 mm Up to 280 mm Up to 280 mm	0.43 µm / 17 µin 1.1 µm / 43 µin 2.1 µm / 83 µin 1.5 µm / 61 µin	Mahr MMQ400 Per ASME B89.3.1
Surface Finish Standards	Ra: up to 100 mm	(0.023 µm + 0.022 µm/µm)	Profilometer ASME B46.1
Profilometer / Surface Finish Tester Length Diameter Straightness	(0.4 to 3) µm Ra Up to 100 mm	0.062µm + 0.096 µm/µm Ra 1.6 µm 1.8 µm 1.1 µm	Using Surface Specimen w/Gage Block w/Sphere w/Optical flat
Dial & Digital Indicators ^{1,2}	(0 to 1) in	(37 + 9.4L) µin	Indicator Calibrator
	(0 to 4) in	(9.1 + 7.6L) µin	Gage Blocks
Indicator's (Probes & LVDT's) ²	(0 to 4) in	(36 + 2.9L) µin	Single Axis Measuring Machine
Calipers (OD& ID) ^{1,2}	(0 to 12) in	(280 + 15L) µin	Gage Blocks
	(12 to 80) in	(410 + 4.5L) µin	
Outside Micrometers & Inside Micrometers ^{1,2}	(0 to 4) in	(31 + 16L) µin	Gage Blocks
	(4 to 40) in	(51 + 11L) µin	
	(40 to 60) in	(250 + 5.6L) µin	
Bore Gages ^{1,2} (Indicator Type)	(0 to 1) in	(37+ 9.4L) µin	Indicator Calibrator
Depth Micrometers ^{1,2}	(0 to 12) in	(64 + 7.2L) µin	Gage Blocks
	(12 to 40) in	(68 + 6.8L) µin	
Height and Depth Gages ^{1,2}	(0 to 60) in	(56 + 7L) µin	Gage Blocks



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Single Axis Measuring Machine ^{1,2}	(0 to 20) in (20 to 60) in	(9.1 + 3.1L) μin (56 + 5.9L) μin	Gage Blocks
Radius Gage ²	Up to 2 in Up to 50 mm	(150 + 17L) μin (3.8 + 0.017L) μm	Video Measuring Machine
Bubble Level (0 to 20) in	(0 to 0.02) in	178 μin or 0.01 °	Sine Plate & Gage Blocks
Protractor	(0 to 45) °	0.16 °	Surface Plate, Sine Bar/Plate, Gage Blocks
	90 °	0.15 °	Surface Plate, Cylindrical Square
	(0 to 180) °	0.03 °	VMM
Optical Comparators ^{1,2} Length Angle	(0 to 12) in Up to 90 °	(100 + 2.6L) μin 0.03 °	Glass Scale Glass Scale
Magnification	10 X 20 X 31.25 X 50 X 62.5 X 100 X	118 μin 102 μin 114 μin 110 μin 122 μin 97 μin	Magnification Scale
Bore Micrometers (3pt) ²	(0 to 8) in	(67 + 9.4L) μin	Master Rings
Measuring Microscope ^{1,2}	(0 to 12) in	(100 + 2.3L) μin	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	(35 + 1.8L) μin (37 + 1.7L) μin (35 + 1.9L) μin	Gage Blocks
Volumetric / Spatial Error	(0 to 40) in	(35 + 1.9L) μin	Gage Blocks
Probing Error	(0 to 8) in	35 μin	Sphere
Squareness	(0 to 8) in	0.002 °	Master Square



Length – Dimensional metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Video Measuring Machines ^{1,2}	X (0 to 12) in Y (0 to 12) in Z (0 to 8) in	(70 + 1.9L) μin (70 + 2L) μin (46 + 5.7L) μin	Glass Scales & Gage Blocks Glass Scale & with Angle Reference
	Angle	0.012 °	
Coating Thickness Gages	Up to 0.2 in Up to 0.5 in	39 μin + 1.1 % of reading 17 μin + 0.021 % of reading	Thickness foils Gage Blocks

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force (Tension only)	0 to 500 lbf	0.002 2 lbf + 0.001 lbf/lbf	Weights & Hanger
Brinell Hardness Testers ¹ (Diameter/Load)	2.5/187.5 Low	13 HBW	ASTM E-10 Indirect Verification with Test Blocks
	2.5/187.5 High	22 HBW	
	10/500 Low	2.6 HBW	
	10/500 High	3.3 HBW	
Vickers Hardness Testers ¹	10/3 000 Low	5.5 HBW	ASTM E-384 Indirect Verification with Test Blocks
	10/3 000 High	15 HBW	
	Low	3.7 % HV	
	Mid	3.6 % HV	
Knoop Hardness Testers ¹	High	3.6 % HV	ASTM E-384 Indirect Verification with Test Blocks
	Low	3.1 % HK	
	Mid	3.1 % HK	
Leeb Hardness Testers ¹	High	3.1 % HK	ASTM-A956 Indirect Verification with Test Blocks
	Low	10 HLD	
Durometer:	Up to 45° Up to 0.5 in	0.05° 130 μin	ASTM D2240 Except Orifice size Weights Optical Comparator

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	HRA		
	Low	1.4 HRA	ASTM E-18 Indirect Verification with Test Blocks
	Mid	1.4 HRA	
	High	0.85 HRA	
	HRBW		
	Low	3.1 HRBW	
	Mid	3.1 HRBW	
	High	1.4 HRBW	
	HRC		
	Low	1.7 HRC	
	Mid	1.5 HRC	
	High	1.2 HRC	
	HREW		
	Low	1.4 HREW	
	Mid	1.4 HREW	
High	1.3 HREW		
HRFW			
Low	1 HRFW		
Mid	1 HRFW		
High	1 HRFW		
Rockwell Superficial Hardness Testers ¹	HR15N		
	Low	1.5 HR15N	ASTM E-18 Indirect Verification with Test Blocks
	Mid	1.4 HR15N	
	High	1 HR15N	
	HR15T		
	Low	2 HR15T	
	Mid	2 HR15T	
	High	1.6 HR15T	
	HR30N		
	Low	1.4 HR30N	
	Mid	1.4 HR30N	
	High	1.2 HR30N	
	HR30T		
	Low	1.9 HR30T	
	Mid	1.4 HR30T	
High	1.6 HR30T		
HR45N			
Low	1.5 HR45N		
Mid	1.5 HR45N		
High	1.3 HR45N		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Superficial Hardness Testers ¹	HR45T Low Mid High	1.8 HR45T 1.6 HR45T 1.4 HR45T	ASTM E-18 Indirect Verification with Test Blocks
Hydraulic Pressure	(0 to 10 000) psig	1.4 psi + 0.000 47psi/psi	Deadweight Tester
Pneumatic / Hydraulic Pressure ¹	(0 to 30) psi (0 to 100) psi (0 to 2 000) psi (0 to 5 000) psig	0.31 psi + 0.002 2 psi/psi 0.58 psi + 0.005 8 psi/psi 1.1 psi + 0.000 32 psi/psi 2.7 psi + 0.001 1 psi/psi	Reference Manometers & Pressure Modules
Barometric Pressure	(0.98 to 1.05) bar	4 mbar	Compared to Barometer
Vacuum ¹	(-14 to 15) psig	0.008 psi	Reference gage & Vacuum / Pressure Module
Torque Analyzers / Testers	(10 to 100) lbf-in (2 to 1 500) lbf-ft	0.86 lbf-in + 0.021 lbf-in / lbf-in 0.02 lbf-ft + 0.001 7 lbf-ft / lbf-ft	Torque Arms with Weights
Torque Wrenches, Drivers, Watches ¹	(10 to 100) lbf-in (5 to 1 500) lbf-ft	0.87 lbf-in + 0.022 lbf-in / lbf-in 0.091 lbf-ft + 0.003 4 lbf-ft / lbf-ft	Transducers with wrench Loader

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Infrared Thermometers	(25 to 500) °C	0.74 °C + 0.004 2 °C/°C	Blackbody w / PRT $\varepsilon = (0.9 \text{ to } 1.0)$ $\lambda = (8 \text{ to } 14) \mu\text{m}$
Relative Humidity ¹ (Measurement)	(30 to 50) %RH	1.4 %RH	Temperature & Humidity Probe
Temperature & Humidity meter ¹	18 °C to 25°C	0.5 °C	Temperature & Humidity Probe
Relative Humidity ¹ (Source)	11.3 %RH 33.1 %RH 75.5 %RH 97.5 %RH	1.6 %RH 1.6 %RH 2 %RH 2.6 %RH	Aqueous Salt Solutions with Digital Tem/Humidity Probe
Thermometers ¹	(50 to 350) °C (350 to 500) °C	0.4 °C 0.45 °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 Sinewave)	5 Hz to 119 Hz 120 Hz to 1 kHz 1 to 120 kHz	0.001 Hz 0.3 mHz + 0.004 6 mHz / Hz 1.1 mHz + 3.7 mHz / kHz	Comparison to a Multifunction Calibrator Fluke 5520A/5522A and Monitored with a Frequency Counter
Frequency Measure ¹	5 Hz to 1 MHz	2.4 mHz + 0.12 mHz/Hz	Comparison to a Universal Counter
Stopwatch & Timers ¹	(1 to 3 600) sec	0.077 sec + 0.000 39 sec/sec	Comparison to a Universal Counter
Tachometer	Up to 100 000 RPM	1.2 RPM + 0.000 52 % of reading	Multifunction Calibrator / Universal Counter

DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement (Mechanical Inspection and Testing) ²	Up to 12 in	(120 + 12L) μin	Video probe utilized as Reference Standard for Dimensional Inspection
Dimensional Measurement (Mechanical Inspection and Testing) ²	Up to 12 in	(143 + 3.6L) μin	Optical Comparator as Reference Standard for Dimensional Inspection
Dimensional Measurement (Mechanical Inspection and Testing) ²	Up to 40 in	(86 + 6.8L) μin	Coordinate Measuring Machine utilized as Reference Standard for Dimensional Inspection

2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement (Mechanical Inspection and Testing) ²	Angle (0 to 360) °	0.035 °	Video probe utilized as Reference Standard for Dimensional Inspection

2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement (Mechanical Inspection and Testing) ²	Angle (0 to 360) °	0.05 °	Optical Comparator as Reference Standard for Dimensional Inspection

3 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Dimensional Measurement (Mechanical Inspection and Testing) ²	Up to 12 in	(144 + 13L) 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 40) in Z = (0 to 24) in Angle (0 to 360) °	(120 + 7.7L) μin 0.032 °	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,
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L1050-1.



Vice President

