



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

OCS Technologies, Inc.
(dba: Ohio Counting Scale / Omni Calibration Services)
14901 Emery Avenue
Cleveland, OH 44135

Fulfills the requirements of

ISO/IEC 17025:2017

In the fields of

CALIBRATION and DIMENSIONAL MEASUREMENT

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

A handwritten signature in black ink, appearing to read 'R. Douglas Leonard Jr.', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 27 November 2025
Certificate Number: L1152-1



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

OCS Technologies, Inc.
 (dba: Ohio Counting Scale / Omni Calibration Services)

14901 Emery Avenue
 Cleveland, OH 44135
 Joseph Gunn 216-741-0224

CALIBRATION AND DIMENSIONAL MEASUREMENT

Valid to: **November 27, 2025**

Certificate Number: **L1152-1**

CALIBRATION

Chemical Quantities

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
pH Meters ² (Fixed Points)	(4, 7, & 10) pH	0.03 pH	Comparisons to Buffer Solutions

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Capacitance – Source ²	(0.19 to 3.3) nF (3.3 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 33) μF (33 to 330) μF (0.33 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	6 mF/F + 12 pF 3 mF/F + 120 pF 3 mF/F + 350 pF 3 mF/F + 2 nF 3mF/F + 4nF 5 mF/F + 35 nF 6 mF/F + 350 nF 6 mF/F + 4 μF 6 mF/F + 12 μF 9 mF/F + 35 μF 13 mF/F + 120 μF	Comparisons performed with a Multifunction Calibrator
DC Current – Source ²	(0 to 30) μA (0 to 3.3) mA (3.3 to 33) mA	180 μA/A + 30 nA 120 μA/A + 60 nA 120 μA/A + 300 nA	Comparisons performed with a Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC Current – Source ²	(33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	120 μ A/A + 14 μ A 230 μ A/A + 48 μ A 440 μ A/A + 48 μ A 580 μ A/A + 600 μ A 1.2 mA/A + 880 μ A	Comparisons performed with a Multifunction Calibrator
	(20 to 1 000) A	9 mA/A + 0.6 mA	Using 50 turn coil
AC Current – Source ²	(29 to 330) μ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	2.4 mA/A + 120 nA 1.8 mA/A + 120 nA 1.5 mA/A + 120 nA 3.5 mA/A + 170 nA 9.3 mA/A + 230 nA 19 mA/A + 460 nA	Comparisons performed with a Multifunction Calibrator
	(0.33 to 3.3) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	2.4 mA/A + 170 nA 1.5 mA/A + 170 nA 1.2 mA/A + 170 nA 230 nA/A + 230 nA 5.8 mA/A + 350 nA 12 mA/A + 690 nA	
	(3.3 to 33) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	2.1 mA/A + 2.3 μ A 1.1 mA/A + 2.3 μ A 470 mA/A + 2.3 μ A 930 μ A/A + 2.3 μ A 2.4 μ A/A + 3.5 μ A 4.7 mA/A + 4.6 μ A	
	(33 to 330) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	2.1 mA/A + 27 μ A 1.1 mA/A + 27 μ A 470 μ A/A + 27 μ A 1.2 mA/A + 60 μ A 2.4 mA/A + 120 μ A 4.7 mA/A + 240 μ A	
	(0.33 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	2.1 mA/A + 120 μ A 700 μ A/A + 120 μ A 7 mA/A + 1.2 mA 29 mA/A + 5.8 mA	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Current – Source ²	(3 to 11) A (45 to 100) Hz 100 Hz 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz 1 kHz (1 to 5) kHz	700 μ A/A + 2.4 mA 1.2 mA/A + 2.4 mA 35 mA/A + 2.4 mA 1.4 mA/A + 5.8 mA 1.7 mA/A + 5.8 mA 35 mA/A + 5.8 mA	Comparisons performed with a Multifunction Calibrator
AC Current – Source ²	(20 to 1 000) A (45 to 65) Hz (65 to 440) Hz	7.2 mA/A + 590 mA 7.8 mA/A + 590 mA	Comparisons performed with a Multifunction Calibrator and using 50 turn coil
DC Current – Measure ²	(0 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 30) A	4.2 nA 38 nA 380 nA 6 μ A 0.16 mA 0.38 % of reading	Comparisons performed with a 8 ½ Digit Multimeter and Current Shunt for > 1 A
AC Current – Measure ² 40 Hz to 1 kHz	(0 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 30) A	114 nA 1.1 μ A 11 μ A 110 μ A 1.3 mA 0.38 % of reading	Comparisons performed with a 8 ½ Digit Multimeter and Current Shunt for > 1 A
Resistance – Source ²	(0 to 33) Ω (33 to 330) Ω 330 Ω to 33 k Ω (33 to 330) k Ω 330 k Ω to 3.3 M Ω (3.3 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω	35 $\mu\Omega/\Omega$ + 240 $\mu\Omega$ 33 $\mu\Omega/\Omega$ + 2.4 m Ω 33 $\mu\Omega/\Omega$ + 24 m Ω 37 $\mu\Omega/\Omega$ + 240 m Ω 70 $\mu\Omega/\Omega$ + 2.4 Ω 300 $\mu\Omega/\Omega$ + 24 Ω 600 $\mu\Omega/\Omega$ + 240 Ω 4 m Ω/Ω + 240 Ω	Comparisons performed with a Multifunction Calibrator
Resistance – Source ²	330 M Ω to 1.1 G Ω (1 to 10.05) G Ω 18.24 G Ω	18 m Ω/Ω + 2400 Ω 1.2 % of reading 0.64 G Ω	Comparisons performed with a Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance – Source Fixed Points ²	1.9 mΩ 10 mΩ 100 mΩ 1 Ω 15 Ω 100 GΩ 1 TΩ	0.84 μΩ 4.2 μΩ 37 μΩ 0.29 mΩ 2.8 mΩ 3.5 GΩ 66 GΩ	Comparisons with Fixed Resistors
Resistance – Measure ²	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ	23 μΩ/Ω + 71 μΩ 22 μΩ/Ω + 360 μΩ 17 μΩ/Ω + 8 μΩ 17 μΩ/Ω + 2.3 mΩ 17 μΩ/Ω + 7.8 mΩ 21 μΩ/Ω + 5.4 Ω 76 μΩ/Ω + 44 Ω 650 μΩ/Ω + 450 Ω 6.3 mΩ/Ω + 23 kΩ	Measured with a 8 ½ Digit Multimeter
RTD Resistance Simulation ²	Pt 385, 100 Ω (-200 to 300) °C (300 to 800) °C Pt 385, 1 000 Ω (-200 to 300) °C (100 to 600) °C	0.18 °C 0.46 °C 0.12 °C 0.14 °C	Comparisons performed with Multifunction Calibrator and Electronic Indicator
DC Voltage – Source ²	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V	24 μV/V + 3 μV 13 μV/V + 14 μV 14 μV/V + 140 μV	Comparisons performed with Multifunction Calibrator
DC Voltage – Source ²	(33 to 330) V (330 to 1 000) V	21 μV/V + 1.3 μV 21 μV/V + 13 μV	
AC Voltage – Source ²	(1 to 33) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	930 μV/V + 8 μV 180 μV/V + 8 μV 240 μV/V + 8 μV 1.2 μV/V + 8 μV 4.1 μV/V + 15 μV 9.3 mV/V + 58 μV	Comparisons performed with Multifunction Calibrator

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Source ²	(33 to 330) mV		Comparisons performed with Multifunction Calibrator
	(10 to 45) Hz	580 $\mu\text{V/V} + 10 \mu\text{V}$	
	45 Hz to 10 kHz	170 $\mu\text{V/V} + 11 \mu\text{V}$	
	(10 to 20) kHz	190 $\mu\text{V/V} + 10 \mu\text{V}$	
	(20 to 50) kHz	410 $\mu\text{V/V} + 13 \mu\text{V}$	
	(50 to 100) kHz	930 $\mu\text{V/V} + 39 \mu\text{V}$	
	(100 to 500) kHz	2.4 mV/V + 87 μV	
	(0.33 to 3.3) V		
	(10 to 45) Hz	350 $\mu\text{V/V} + 100 \mu\text{V}$	
	45 Hz to 10 kHz	180 $\mu\text{V/V} + 150 \mu\text{V}$	
	(10 to 20) kHz	220 $\mu\text{V/V} + 120 \mu\text{V}$	
	(20 to 50) kHz	350 $\mu\text{V/V} + 68 \mu\text{V}$	
	(50 to 100) kHz	810 $\mu\text{V/V} + 180 \mu\text{V}$	
	(100 to 500) kHz	2.8 mV/V + 840 μV	
	(3.3 to 33) V		
	(10 to 45) Hz	350 $\mu\text{V/V} + 890 \mu\text{V}$	
	45 Hz to 10 kHz	180 $\mu\text{V/V} + 910 \mu\text{V}$	
	(10 to 20) kHz	280 $\mu\text{V/V} + 910 \mu\text{V}$	
	(20 to 50) kHz	410 $\mu\text{V/V} + 840 \mu\text{V}$	
	(50 to 100) kHz	1.1 mV/V + 2.1 mV	
(33 to 330) V			
45 Hz to 1 kHz	220 $\mu\text{V/V} + 5.2 \text{ mV}$		
(1 to 10) kHz	240 $\mu\text{V/V} + 7.8 \text{ mV}$		
(10 to 20) kHz	290 $\mu\text{V/V} + 7.4 \text{ mV}$		
(20 to 50) kHz	350 $\mu\text{V/V} + 7.4 \text{ mV}$		
(50 to 100) kHz	2.4 mV/V + 58 mV		
(330 to 1 000) V			
45 Hz to 1 kHz	2.4 mV/V + 58 mV		
(1 to 5) kHz	2.4 mV/V + 58 mV		
(5 to 10) kHz	2.4 mV/V + 58 mV		
DC Voltage – Measure ²	(0 to 1) V	14 μV	Measured with an 8 ½ Digit Multimeter
	(1 to 10) V	130 μV	
	(10 to 100) V	1.5 mV	
	(100 to 1 000) V	15 mV	
AC Voltage – Measure ² 45 Hz to 1 kHz	(1 to 10) mV	4 μV	Measured with an 8 ½ Digit Multimeter
	(10 to 100) mV	12 μV	
	100 mV to 1 V	120 μV	
	(1 to 10) V	1.2 mV	
	(10 to 100) V	28 mV	
	(100 to 700) V	380 mV	



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Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
DC High Voltage – Measure ²	(0.1 to 9) kV (9 to 50) kV (50 to 90) kV	0.05% of reading 0.08% of reading 0.13% of reading	Comparisons performed with a Precision HV Meter
AC High Voltage – Measure ² 50 Hz to 60 Hz	(0.1 to 9) kV (9 to 50) kV (50 to 90) kV	0.16 % of reading 0.16 % of reading 0.18 % of reading	
Oscilloscopes ² DC Voltage (50Ω) DC Voltage (1MΩ) AC Voltage (50Ω) (Square Wave) AC Voltage (1MΩ) (Square Wave)	1 mV to 6.6 V 1 mV to 130 V 1 mV to 6.6 V 1 mV to 130 V	2.9 mV/V + 47 μV 600 μV/V + 47 μV 2.9 mV/V + 47 μV 1.2 mV/V + 47 μV	Comparisons performed with a Multifunction Calibrator and an Oscilloscope
Leveled Sinewave	5 mV to 5.5 V 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz 600 MHz to 1.1 GHz	41 mV/V + 350 μV 47 mV/V + 350 μV 70 mV/V + 350 μV 81 mV/V + 350 μV	
Time Markers	2 ns to 20 ms 50 ms to 5 s	3 μs/s 2 ms/s + 29 μs	
Edge Characteristics: (1 kHz to 10 MHz into 50 Ω) Amplitude Rise time	5 mV to 2.5 V 1 nS to 1 μs	23 mV/V + 240 μV 350 ps	
Millivolt Simulation of Thermocouple Indicators ²	Type J (-200 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.32 °C 0.2 °C 0.17 °C 0.21 °C 0.27 °C	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Millivolt Simulation of Thermocouple Indicators ²	Type K		Comparisons performed with Multifunction Calibrator and Thermocouple Indicator
	(-200 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 1 000) °C	0.31 °C	
	(1000 to 1 372) °C	0.47 °C	
	Type T		
	(-250 to -100) °C	0.73 °C	
	(-100 to 0) °C	0.28 °C	
	(0 to 120) °C	0.19 °C	
	(120 to 400) °C	0.17 °C	
	Type E		
	(-250 to -100) °C	0.58 °C	
	(-100 to -25) °C	0.2 °C	
(-25 to 350) °C	0.17 °C		
(350 to 650) °C	0.19 °C		
(650 to 1 000) °C	0.25 °C		
Type R			
(0 to 1 767) °C	0.88 °C		
Type S			
(0 to 1 767) °C	0.79 °C		

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Gage Blocks ⁶ Chrome Carbide	(0.01 to 4) in	(5 + 1.5L) µin	P&W LabMaster Universal and Fed GGG Grade 0.5 Gage Blocks
Gage Blocks ⁶ Steel, Ceramic, Tungsten Carbide	(0.01 to 4) in	(5.6 + 3.1L) µin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Gage Blocks ⁶ Steel	(5 to 12) in	(4 + 3.1L) µin	
Plug /Pin Gages & Master Discs ⁶ Class XXX, XX, X, Y, Z, ZZ	(0.01 to 0.06) in	11 µin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
	(0.06 to 1) in	8 µin	
	(1 to 12) in	(3.2 + 4D) µin	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Pin Gages ² Class ZZ	(0.01 to 2) in	78 μin	Comparisons with Laser Micrometer
Micrometer/Length/End Standards ⁶	(1 to 12) in	(4 + 4.2L) μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Ring Gages ⁶	(0.04 to 1) in	18 μin	P&W LabMaster Universal, ASME Grade 00 Gage Blocks and Master Rings
	(1 to 12) in	(8.4 + 3.9D) μin	
Spheres/Precision Balls: Diameter	(0.1 to 3) in	15 μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Thread Wires ³ 2 TPI to 120 TPI	(0.004 to 0.29) in	13 μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Thread Plug Gages – Straight Major Diameter	(0.06 to 6) in	53 μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks with Thread Wires
Pitch Diameter	(4 thru 80) TPI	78 μin	
Thread Plug Gages ^{3/4} TPF Pitch Diameter	(0.3 to 6) in (8 thru 27) TPI	69 μin 90 μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks with Thread Wires
Thread Ring Gages - Functional Pitch Diameter	(0.06 to 12) in (4 thru 80) TPI	89 μin	In Accordance with ASME B1.2, Paragraph 5.1.1; the Ring is Sized to a Plug with the Plug's Uncertainty Given. Class X or W Set Plugs to be Used as Available
Angle Blocks	(0 to 90)°	0.006°	Vision System
Micrometers ^{2,6}	(0 to 4) in (4 to 80) in	(98 + 4L) μin (58 + 10L) μin	Comparisons performed with Gage Blocks
Calipers ^{2,6} (OD, ID, depth)	(0 to 4) in (4 to 80) in	(100 + 4L) μin (300 + 4L) μin	
Height Gages ^{2,6}	(0 to 4) in (4 to 60) in	(170 + 2L) μin (280 + 8L) μin	
Chamfer Gages ²	(0 to 0.75) in	0.001 in	Sharp Edge Ring Gages / Surface Plate

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Dial/Test Indicators ²	(0 to 1) in	81 μin	Comparisons performed with Indicator Calibrator
Dial/Test Indicators	(0 to 1) in	18 μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
	(1 to 4) in	293 μin	
Micrometer Heads	(0 to 1) in	18 μin	P&W LabMaster Universal
Indicating Snap Gages ^{2,6}	(0 to 4) in (4 to 40) in	(100 + 4L) μin (560 + 6L) μin	Comparisons performed with Gage Blocks
Bore Gages – 2 Point ^{2,6}	(0.125 to 4) in (4 to 40) in	(100 + 4L) μin (260 + 8L) μin	Comparisons performed with Gage Blocks and End Caps
Rules & Tape Measures ²	(0 to 72) in (6 to 100) ft	0.02 in 0.026 % of reading	Comparisons performed with Gage Blocks
Bench Micrometer ²	(0.1 to 2) in	24 μin	Comparisons performed with ASME Grade 0 Gage Blocks
Laser Micrometers ²	(0.06 to 1) in	61 μin	Master Plug Gages
Optical Comparators ²			
X and Y Axis Linearity	(0 to 12) in	190 μin	Comparisons to Glass Scale Comparison performed with Angle Blocks
Magnification	(10, 20, 31.25, 50, 62.5, & 100) x	190 μin	
Angle	(5, 10, 15, 20, 25, & 30)°	0.12°	
Vision System ²			
X-Y Linearity	(0 to 12) in	(68 + 6.4L) μin	Comparison to Grid Glass Gage Blocks
Z - Axis	(0 to 8) in	(49 + 2.7L) μin	
Protractors			
Angle	(0, 5, 10, 15, 20, 25, & 30)°	0.12°	Comparisons performed with Angle Blocks and Surface Plate Digital Protractor
Level	(0 to 90)°	0.27°	
	0°	0.27°	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Bore Gages – 3 Point ^{2,6}	(0.125 to 7) in	(110 + 9L) μin	Comparisons performed with Customer Ring Gages calibrated by OCS

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Force –Tension & Compression ^{1,2}	(0.05 to 500) lbf (501 to 6 000) lbf	0.045 % of reading 0.093 % of reading	Reference Weights
(Force Gages, Load Cells with Indicators, Testing Machines)	(17 to 200) lbf (50 to 2 000) lbf (46 to 1 000) lbf (200 to 10 000) lbf (10 000 to 20 000) lbf (20 000 to 30 000) lbf (30 000 to 50 000) lbf	0.18 lbf 0.23 lbf 0.27 lbf 0.5 lbf 4.6 lbf 6.9 lbf 12 lbf	Morehouse Precision Load Cells
Force Testing Machine Crosshead Travel	(0.1 to 6) in	0.002 in	Digital Caliper
Force Testing Machine Crosshead Speed	(0.5 to 12) in/min	0.04 in/min	Digital Stopwatch/Caliper
Bench Micrometer Contact Force	(2 to 32) ozf (32 to 40) ozf	0.8 ozf 2.2 ozf	Force Gages
Full Verification of Durometers – Spring Force	Type A, B, C, D, DO, O, OO	1.1 Duro	ASTM D2240 with Balance / ASTM Class 6 Test Weights
Indenter Extension, Diameter, Tip Radius	(0 to 0.2) in	250 μin	Vision System
Indenter Tip Angle	(0 to 45)°	0.2°	Vision System



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Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Rockwell Hardness Testers ²	HRC		Indirect Verification per ASTM E18
	Low	0.38 HRC	
	Middle	0.35 HRC	
	High	0.32 HRC	
	HRBW		
	Low	0.71 HRBW	
	Middle	0.72 HRBW	
	High	0.73 HRBW	
	HRA		
Low	0.48 HRA		
Middle	0.39 HRA		
High	0.53 HRA		
Superficial Rockwell Hardness Testers ²	HR15N		Indirect Verification per ASTM E18
	Low	0.5 HR15N	
	Middle	0.48 HR15N	
	High	0.43 HR15N	
	HR30N		
	Low	0.73 HR30N	
	Middle	0.73 HR30N	
	High	0.53 HR30N	
	HR45N		
	Low	0.49 HR45N	
	Middle	0.58 HR45N	
	High	0.51 HR45N	
	HR15TW		
	Low	0.73 HR15TW	
	Middle	0.64 HR15TW	
	High	0.44 HR15TW	
	HR30TW		
	Low	0.58 HR30TW	
	Middle	0.55 HR30TW	
	High	0.46 HR30TW	
	HR45TW		
Low	0.64 HR45TW		
Middle	0.67 HR45TW		
High	0.42 HR45TW		



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Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Weights	1 mg to 160 g (160 to 400) g	0.57 mg 3.2 mg	Mass value or deviation reported using High Resolution Scales that have been Calibrated with ASTM Class 1 Test Weights
Weights ²	(0.8 to 10) lb (10 to 27.5) lb (27.5 to 70) lb	0.000 07 lb 0.000 7 lb 0.001 7 lb	Mass value or deviation reported using High Resolution Scales That Have Been calibrated with ASTM Class 3 Test Weights
Pressure Transducers, Dial and Digital Pressure Gages, Absolute Pressure Instruments, Low Vacuum Gages ² (Pneumatic and Hydraulic)	(0.001 to 1) inH ₂ O (1 to 20) inH ₂ O	0.006 inH ₂ O 0.047 inH ₂ O	Comparisons to a Manometer
Pressure Transducers, Dial and Digital Pressure Gages, Absolute Pressure Instruments, Low Vacuum Gages ² (Pneumatic and Hydraulic)	(-0.01 to -14.5) psi (0.2 to 100) psia (0.001 to 3) psi (3 to 15) psi (15 to 60) psi (60 to 120) psi (120 to 180) psi (180 to 240) psi (240 to 300) psi	0.061 psi 0.06 psia 0.005 psi 0.001 4 psi + 0.11% of reading 0.08 psi 0.15 psi 0.22 psi 0.28 psi 0.35 psi	Comparisons to Digital Pressure Gages
Pressure Transducers, Dial and Digital Pressure Gages, Absolute Pressure Instruments, Low Vacuum Gages ^{2,4} (Pneumatic and Hydraulic)	(300 to 1 000) psi (1 000 to 2 000) psi (2 000 to 4 000) psi (4 000 to 6 000) psi (6 000 to 8 000) psi (8 000 to 10 000) psi (10 000 to 30 000) psi	0.66 psi 2.5 psi 4.8 psi 7.1 psi 9.5 psi 12 psi 71 psi	Comparisons to Digital Pressure Gages
Weighing Systems ^{1,2}	(0 to 500) mg	0.12 mg	ASTM E617 Class 1 Weights and NIST Handbook 44 utilized for the calibration of the Weighing System
	(1 to 20) g	0.005 % applied load	
	(21 to 60 000) g	0.000 3 % applied load	

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Weighing Systems ^{1,2}	(0.005 to 120 000) lb	0.013 % applied load	NIST Class F Weights and NIST Handbook 44 utilized for the calibration of the Weighing System
Torque Wrenches, Drivers, Screwdrivers including Click Type	(10 to 100) ozf-in (100 to 500) ozf-in	1.9 % of reading	Torque Tester and Torque Cells
	(10 to 100) lbf-in (5 to 50) lbf-ft (50 to 1 000) lbf-ft	1.5 % of reading	
Torque Transducers, Torque Analyzers, Dial Torque Wrenches ²	(3 to 640) ozf-in (7.5 to 1 200) lbf-in (100 to 1 000) lbf-ft	0.13 % of reading + 0.11 ozf-in 0.14 % of reading + 0.05 lbf-in 0.14 % of reading + 0.09 lbf-ft	Torque Arms and ASTM Class 6 Weights

Thermodynamic

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Infrared (IR) Thermometers ²	(-15 to 100) °C	1.7 °C	Fluke / Hart Scientific 4180 / 4181 Precision IR Calibrators $\epsilon = (0.9 \text{ to } 0.99)$ $\lambda = (8 \text{ to } 14) \mu\text{m}$
	(100 to 200) °C	1.9 °C	
	(200 to 350) °C	2.8 °C	
	(350 to 500) °C	3.4 °C	
Relative Humidity Probes ²	11.3 % RH	1.5 % RH	Comparisons to Salt Solutions
	75.5 % RH	1.8 % RH	
	95 % RH	2.3 % RH	
Humidity Measure	(11 to 75) % RH	2.5 % RH	Comparisons to a Humidity Indicator and Probe
	(75 to 95) % RH	3 % RH	
Temperature Chambers, Drywells, Temperature Baths ²	(-80 to 300) °C	0.09 °C	Measurement with a Platinum Resistance Thermometer and/or Type K TC with display
	(300 to 1 200) °C	5.8 °C	
Temperature Devices - (Liquid in Glass Thermometers, Thermocouples, Bi-Metal Thermometers) ^{2,7}	(-80 to 300) °C	0.09 °C	Comparisons with a Platinum Resistance Thermometer and Bath or Chamber
	(300 to 600) °C	2.5 °C	
	(600 to 1 200) °C	3.1 °C	Dry Block Calibrator

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Tachometers – Non-Contact ²	(0.6 to 1 000) rpm (1 000 to 10 000) rpm (10 000 to 100 000) rpm	0.06 rpm 0.6 rpm 0.65 rpm	Comparisons performed with a Frequency Source and LED
Tachometers – Contact, Centrifuges, RPM Meters ²	(0.6 to 1 000) rpm (1000 to 10 000) rpm (10 000 to 100 000) rpm	1.2 rpm 1.7 rpm 8.2 rpm	Comparisons performed with a Photo/Contact Tachometer
Linear Surface Speed Indicators / Conveyor Belt Speed ²	(3 to 100) ft/min (100 to 300) ft/min (300 to 1 000) ft/min	0.71 ft/min 0.78 ft/min 1.3 ft/min	Comparisons performed with a Contact Tachometer and Wheel
Length - Footage Counter, Yardage Counter	(3 to 100) ft (100 to 300) ft (300 to 1 000) ft	0.75 ft 0.82 ft 1.4 ft	
Frequency ² – Source	(10 to 119.99) Hz 120 Hz to 1.199 9 kHz (1.2 to 11.999) kHz (12 to 119.99) kHz 120 kHz to 1.2 MHz	380 μHz 3.7 mHz 0.037 Hz 0.37 Hz 3.7 Hz	Comparisons performed with a Multifunction Calibrator
Timers / Stopwatches ²	1 s to 4 h	0.35 s	Comparisons performed with Reference Stopwatch
	(4 to 24) h	1 s	

DIMENSIONAL MEASUREMENT

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Diameter Length ^{5,6}	(0.1 to 4) in (4 to 12) in	27 μin (15 + 2.5L) μin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Inside Diameter ^{5,6}	(0.1 to 4) in (4 to 12) in	27 μin (15 + 2.5L) μin	
Outside Diameter Length ²	(0.000 5 to 1.5) in	59 μin	Universal Measurement Machine
Outside Diameter Length ²	(0.001 to 1) in	180 μin	Digital Micrometer
Outside Diameter Inside Diameter Length Depth ²	(0.001 to 12) in	0.001 4 in	Digital Caliper

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inside Diameter ⁸	(0.011 to 0.5) in	0.001 2 in	Plug Gages
Vision System Measurements ⁹	<u>Linear X and Y</u> (0 to 1) in (1 to 6) in (6 to 10) in	250 μin 280 μin 330 μin	Vision System


2 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vision System Measurements ⁹	<u>Linear X and Y</u> (0 to 1) in (1 to 6) in (6 to 10) in	250 μin 280 μin 330 μin	Vision System
	<u>Angle</u> (0 to 90)°	0.006°	
Angle	(0 to 90)°	0.27°	Digital Protractor
Level	0°	0.27°	

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. The uncertainties for scales, balances, and force gages is highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration
2. 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.
3. Uncertainty shown is per wire for thread wire sets
4. Pressures from 10 000 psi to 30 000 psi can only be measured with a customer supplied pressure source
5. Micrometer Masters, Caliper Masters, Feeler Gages & shims would be included in this category.
6. L = length in inches, D = diameter in inches
7. For thermometers, measurement uncertainty may vary depend on type of thermometer, display resolution and immersion type.
8. Crimp Tools would be included in this category.
9. Radius Gages and Angle Blocks would be included in this category.
10. This scope is formatted as part of a single document including Certificate of Accreditation No. L1152-1



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