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.

Jason Stine, Vice President

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 [2,10] (Fixed Points)	4 pH 7 pH 10 pH	0.03 pH 0.03 pH 0.03 pH	Comparisons to Accredited 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 + 0.12 nF 3 mF/F + 0.35 nF 3 mF/F + 2 nF 3mF/F + 4nF 5 mF/F + 35 nF 6 mF/F + 0.35 µF 6 mF/F + 4 µF 6 mF/F + 12 µF 9 mF/F + 35 µF 13 mF/F + 0.12 mF	Comparisons performed with a Multifunction Calibrator
DC Current – Source [2]	(0 to 30) µA (0 to 3.3) mA (3.3 to 33) mA	0.18 mA/A + 30 nA 0.12 mA/A + 60 nA 0.12 mA/A + 0.3 µA	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	0.12 mA/A + 14 µA 0.23 mA/A + 48 µA 0.44 mA/A + 48 µA 0.58 mA/A + 0.6 mA 1.2 mA/A + 0.9 mA	Comparisons performed with a Multifunction Calibrator
DC Current – Source [2] (Current Clamp-on Meters)	(20 to 1 000) A	9 mA/A + 0.6 mA	Comparisons performed with a Multifunction Calibrator and using 50-turn Coil
AC Current – Source [2]	(29 to 330) µA (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 (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 (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 (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 (0.33 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 2.4 mA/A + 0.12 µA 1.8 mA/A + 0.12 µA 1.5 mA/A + 0.12 µA 3.5 mA/A + 0.17 µA 9.3 mA/A + 0.23 µA 19 mA/A + 0.46 µA 2.4 mA/A + 0.17 µA 1.5 mA/A + 0.17 µA 1.2 mA/A + 0.17 µA 0.23 µA/A + 0.23 µA 5.8 mA/A + 0.35 µA 12 mA/A + 0.69 µA 2.1 mA/A + 2.3 µA 1.1 mA/A + 2.3 µA 0.47 mA/A + 2.3 µA 0.93 mA/A + 2.3 µA 2.4 µA/A + 3.5 µA 4.7 mA/A + 4.6 µA 2.1 mA/A + 27 µA 1.1 mA/A + 27 µA 0.47 mA/A + 27 µA 1.2 mA/A + 60 µA 2.4 mA/A + 0.12 mA 4.7 mA/A + 0.24 mA 2.1 mA/A + 0.12 mA 0.7 mA/A + 0.12 mA 7 mA/A + 1.2 mA 29 mA/A + 5.8 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 [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 µA/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] (Current Clamp-on Meters)	(20 to 1 000) A (45 to 65) Hz (65 to 440) Hz	 7.2 mA/A + 0.59 A 7.8 mA/A + 0.59 A	Comparisons performed with a Multifunction Calibrator and using 50-turn Coil
DC Current – Measure [2]	(0 to 100) µA (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 µA 0.16 mA 0.38 % of reading	Comparisons performed with a 8.5 Digit Multimeter and Current Shunt for > 1 A
DC Current – Measure [2]	(30 to 60) A (60 to 540) A	2.4 A 3.8 % of reading	Comparison performed with a Current Clamp Meter
AC Current – Measure [2]	40 Hz to 1 kHz Up to 100 µA (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 µA 11 µA 110 µA 1.3 mA 0.38 % of reading	Comparisons performed with a 8.5 Digit Multimeter and Current Shunt for > 1 A
AC Current – Measure [2]	60 Hz (30 to 60) A (60 to 2 250) A	 4.5 % of reading 4.5 % of reading	Comparison performed with a Current Clamp Meter

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Resistance – Source [2] (Simulation)	(0 to 33) Ω (33 to 330) Ω 330 Ω to 33 kΩ (33 to 330) kΩ 330 kΩ to 3.3 MΩ (3.3 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ (1 to 10.05) GΩ 18.24 GΩ	35 µΩ/Ω + 0.24 mΩ 33 µΩ/Ω + 2.4 mΩ 33 µΩ/Ω + 24 mΩ 37 µΩ/Ω + 0.24 Ω 70 µΩ/Ω + 2.4 Ω 0.3 mΩ/Ω + 24 Ω 0.6 mΩ/Ω + 0.24 kΩ 4 mΩ/Ω + 0.24 kΩ 18 mΩ/Ω + 2.4 kΩ 1.2 % of reading 0.64 GΩ	Comparisons performed with a Multifunction Calibrator
Resistance – Source [2] (Fixed Artifacts)	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 + 0.36 mΩ 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 0.65 mΩ/Ω + 0.45 kΩ 6.3 mΩ/Ω + 23 kΩ	Measured with an 8.5 Digit Multimeter
Surface Resistance – Measure [2]	1.1 kΩ to 10 GΩ	12 % of reading	Measured with a Surface Resistance Meter
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 (33 to 330) V (330 to 1 000) V	24 µV/V + 3 µV 13 µV/V + 14 µV 14 µV/V + 140 µV 21 µV/V + 1.3 µV 21 µV/V + 13 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]	(1 to 33) mV		Comparisons performed with Multifunction Calibrator
	(10 to 45) Hz	0.93 mV/V + 8 µV	
	45 Hz to 10 kHz	0.18 mV/V + 8 µV	
	(10 to 20) kHz	0.24 mV/V + 8 µV	
	(20 to 50) kHz	1.2 µV/V + 8 µV	
	(50 to 100) kHz	4.1 µV/V + 15 µV	
	(100 to 500) kHz	9.3 mV/V + 58 µV	
	(33 to 330) mV		
	(10 to 45) Hz	0.58 mV/V + 10 µV	
	45 Hz to 10 kHz	0.17 mV/V + 11 µV	
	(10 to 20) kHz	0.19 mV/V + 10 µV	
	(20 to 50) kHz	0.41 mV/V + 13 µV	
	(50 to 100) kHz	0.93 mV/V + 39 µV	
	(100 to 500) kHz	2.4 mV/V + 87 µV	
	(0.33 to 3.3) V		
	(10 to 45) Hz	0.35 mV/V + 0.1 mV	
	45 Hz to 10 kHz	0.18 mV/V + 0.15 mV	
	(10 to 20) kHz	0.22 mV/V + 0.12 mV	
	(20 to 50) kHz	0.35 mV/V + 68 µV	
	(50 to 100) kHz	0.81 mV/V + 0.18 mV	
	(100 to 500) kHz	2.8 mV/V + 0.84 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	0.35 mV/V + 0.89 mV	
	45 Hz to 10 kHz	0.18 mV/V + 0.91 mV	
	(10 to 20) kHz	0.28 mV/V + 0.91 mV	
	(20 to 50) kHz	0.41 mV/V + 0.84 mV	
	(50 to 100) kHz	1.1 mV/V + 2.1 mV	
	(33 to 330) V		
	45 Hz to 1 kHz	0.22 mV/V + 5.2 mV	
	(1 to 10) kHz	0.24 mV/V + 7.8 mV	
	(10 to 20) kHz	0.29 mV/V + 7.4 mV	
	(20 to 50) kHz	0.35 mV/V + 7.4 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 8.5 Digit Multimeter
	(1 to 10) V	0.13 mV	
	(10 to 100) V	1.5 mV	
	(100 to 1 000) V	15 mV	

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
AC Voltage – Measure [2]	45 Hz to 1 kHz (1 to 10) mV (10 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 700) V	 4 µV 12 µV 0.12 mV 1.2 mV 28 mV 0.38 V	Measured with an 8.5 Digit Multimeter
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 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 (50 Ω) DC Voltage (1 MΩ) AC Voltage (50 Ω) (Square Wave) AC Voltage (1MΩ) (Square Wave) Leveled Sinewave Time Markers Edge Characteristics: (into 50 Ω) Amplitude Rise time	 1 mV to 6.6 V 1 mV to 130 V 1 mV to 6.6 V 1 mV to 130 V 5 mV to 5.5 V 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 600 MHz to 1.1 GHz 2 ns to 20 ms 50 ms to 5 s 1 kHz to 10 MHz 5 mV to 2.5 V 1 kHz to 10 MHz 1 nS to 1 µs	 2.9 mV/V + 47 µV 0.6 mV/V + 47 µV 2.9 mV/V + 47 µV 1.2 mV/V + 47 µV 41 mV/V + 0.35 mV 47 mV/V + 0.35 mV 70 mV/V + 0.35 mV 81 mV/V + 0.35 mV 3 µs/s 2 ms/s + 29 µs 23 mV/V + 0.24 mV 350 ps	Comparisons performed with a Multifunction Calibrator and an Oscilloscope

Electrical – DC/Low Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
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 Type K (-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1 000) °C (1000 to 1 372) °C Type T (-250 to -100) °C (-100 to 0) °C (0 to 120) °C (120 to 400) °C Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C Type R (0 to 1 767) °C Type S (0 to 1 767) °C	 0.32 °C 0.2 °C 0.17 °C 0.21 °C 0.27 °C 0.39 °C 0.22 °C 0.19 °C 0.31 °C 0.47 °C 0.73 °C 0.28 °C 0.19 °C 0.17 °C 0.58 °C 0.2 °C 0.17 °C 0.19 °C 0.25 °C 0.88 °C 0.79 °C	Comparisons performed with Multifunction Calibrator and Thermocouple Indicator

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 + 1.5*L*) 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 + 3.1*L*) µin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks
Gage Blocks [6] (Steel)	(5 to 12) in	(4 + 3.1*L*) µin	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
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 + 4*D*) µin	
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 + 4.2*L*) 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 + 3.9*D*) 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 Pitch Diameter	(0.06 to 6) in (4 to 80) TPI	53 µin 78 µin	P&W LabMaster Universal and ASME Grade 00 Gage Blocks with Thread Wires
Thread Plug Gages ¾ 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 + 4*L*) µin (58 + 10*L*) µin	Comparisons performed with Gage Blocks
Calipers [2,6] (OD, ID, depth)	(0 to 4) in (4 to 80) in	(100 + 4*L*) µin (300 + 4*L*) µin	

Length – Dimensional Metrology

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Height Gages [2,6]	(0 to 4) in (4 to 60) in	(170 + 2*L*) µin (280 + 8*L*) µin	Comparisons performed with Gage Blocks
Chamfer Gages [2]	(0 to 0.75) in	0.001 in	Sharp Edge Ring Gages / Surface Plate
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 + 4*L*) µin (560 + 6*L*) µin	Comparisons performed with Gage Blocks
Bore Gages – 2 Point [2,6]	(0.125 to 4) in (4 to 40) in	(100 + 4*L*) µin (260 + 8*L*) 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
Magnification	(10, 20, 31.25, 50, 62.5, 100) X	190 µin	
Angle	(5, 10, 15, 20, 25, & 30) °	0.12°	Comparison performed with Angle Blocks
Vision System [2] X-Y Axis Linearity	(0 to 12) in	(68 + 6.4*L*) µin	Comparison to Grid Glass
Z Axis Linearity	(0 to 8) in	(49 + 2.7*L*) µin	Gage Blocks
Protractors Angle	(0, 5, 10, 15, 20, 25, & 30) °	0.12°	Comparisons performed with Angle Blocks and Surface Plate
Level	(0 to 90) °	0.27°	
	0°	0.27°	Digital Protractor

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 + 9*L*) 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

Mass and Mass Related

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

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
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_2O (1 to 20) inH_2O	0.006 inH_2O 0.047 inH_2O	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	
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

Mass and Mass Related

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Torque Wrenches, Drivers, Screwdrivers, including Click Type	(10 to 100) lbf·in (5 to 50) lbf·ft (50 to 1 000) lbf·ft	1.5 % of reading	Torque Tester and Torque Cells
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 (100 to 200) °C (200 to 350) °C (350 to 500) °C	1.7 °C 1.9 °C 2.8 °C 3.4 °C	Fluke/Hart 4180/4181 Precision IR Calibrators (flat plate) ε= (0.9 to 0.99) λ = (8 to 14) µm
Relative Humidity Probes [2]	(7 to 45) % RH (45 to 90) % RH (90 to 95) % RH	0.64 % RH 0.78 % RH 0.84 % RH	Fluke 5128A Humidity Generator
Humidity Measure	(7 to 90) % RH (90 to 95) % RH	2 % RH 2.5 % RH	Comparisons to a Humidity Indicator with Probe
Temperature Chambers, Drywells, Temperature Baths[2]	(-80 to 300) °C (300 to 650) °C (650 to 1 200) °C	0.09 °C 0.23 °C 5.8 °C	Measurement with a Platinum Resistance Thermometer and/or Type K TC with display
Temperature Devices - (Liquid in Glass Thermometers, Thermocouples, Bi-Metal Thermometers) [2,7]	(-80 to 300) °C (300 to 650) °C	0.09 °C 0.23 °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 [2,6]	(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

Time and Frequency

Parameter / Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method and/or Equipment
Tachometers – Contact, Centrifuges, RPM Meters [2,6]	(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 [2,6]	(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 – Source [2]	(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 Length [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
Inside Diameter Length [8]	(0.011 to 0.5) in	0.001 2 in	Plug Gages

1 Dimensional

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vision System Measurements [9]	Linear X and Y (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]	Linear X and Y (0 to 1) in (1 to 6) in (6 to 10) in	 250 µin 280 µin 330 µin	Vision System
	Angle (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; rpm = revolutions per minute.
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. The values presented here are approximate. The actual, certified values will be used at the time of calibration, along with the associated measurement uncertainty.
11. This scope is formatted as part of a single document including Certificate of Accreditation No. L1152-1

Jason Stine, Vice President