



# CERTIFICATE OF ACCREDITATION

**The ANSI National Accreditation Board**

Hereby attests that

**Cornerstone Metrology Service Inc.**

**7625 Hayvenhurst Avenue, #20  
Van Nuys, CA 91406**

Fulfills the requirements of

**ISO/IEC 17025:2017**

and national standards

**ANSI/NCSL Z540-1-1994 (R2002) AND**

**ANSI/NCSL Z540.3-2006 (R2013)**

In the field of

**CALIBRATION**

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](http://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: 13 February 2025

Certificate Number: AC-1376



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**

**AND**

**ANSI/NCSL Z540-1-1994 (R2002)**

**ANSI/NCSL Z540.3-2006 (R2013)**

**Cornerstone Metrology Service Inc.**

7625 Hayvenhurst Avenue, #20

Van Nuys, CA 91406

Michael Chauvie 818-902-9551

**CALIBRATION**

Valid to: **February 13, 2025**

Certificate Number: **AC-1376**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source <sup>1</sup>	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 020) V	5 $\mu$ V/V + 1 $\mu$ V 4 $\mu$ V/V + 3 $\mu$ V 4 $\mu$ V/V + 30 $\mu$ V 4.5 $\mu$ V/V + 0.3 mV 4.5 $\mu$ V/V + 0.9 mV	Fluke 5500A Multiproduct Calibrator
DC Current – Source <sup>1</sup>	(0 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 2.2) A (2.2 to 11) A	0.13 mA/A + 50 nA 0.1 mA/A + 0.25 $\mu$ A 0.1 mA/A + 3.3 $\mu$ A 0.3 mA/A + 44 $\mu$ A 0.6 mA/A + 0.33 mA	Fluke 5500A Multiproduct Calibrator
AC Voltage – Source <sup>1</sup>	(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	3.5 mA/A + 20 $\mu$ V 1.5 mA/A + 20 $\mu$ V 2 mA/A + 20 $\mu$ V 2.5 mA/A + 20 $\mu$ V 3.5 mA/A + 33 $\mu$ V 10 mA/A + 60 $\mu$ V	Fluke 5500A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source <sup>1</sup>	(33 to 330) mV		Fluke 5500A Multiproduct Calibrator
	(10 to 45) Hz	2.5 mV/V + 50 μV	
	45 Hz to 10 kHz	0.5 mV/V + 20 μV	
	(10 to 20) kHz	1 mV/V + 20 μV	
	(20 to 50) kHz	1.6 mV/V + 40 μV	
	(50 to 100) kHz	2.4 mV/V + 0.17 mV	
	(100 to 500) kHz	7 mV/V + 0.33 mV	
	(0.33 to 3.3) V		
	(10 to 45) Hz	1.5 mV/V + 0.25 mV	
	45 Hz to 10 kHz	0.3 mV/V + 60 μV	
	(10 to 20) kHz	0.8 mV/V + 60 μV	
	(20 to 50) kHz	1.4 mV/V + 0.3 mV	
	(50 to 100) kHz	2.4 mV/V + 1.7 mV	
	(100 to 500) kHz	5 mV/V + 3.3 mV	
	(3.3 to 33) V		
	(10 to 45) Hz	1.5 mV/V + 2.5 mV	
	45 Hz to 10 kHz	0.4 mV/V + 0.6 mV	
	(10 to 20) kHz	0.8 mV/V + 2.6 mV	
	(20 to 50) kHz	1.9 mV/V + 5 mV	
	(50 to 100) kHz	2.4 mV/V + 17 mV	
(33 to 330) V			
45 Hz to 1 kHz	0.5 mV/V + 6.6 mV		
(1 to 10) kHz	0.8 mV/V + 15 mV		
(10 to 20) kHz	0.9 mV/V + 33 mV		
(330 to 1 020) V			
45 Hz to 1 kHz	0.5 mV/V + 80 mV		
(1 to 5) kHz	2 mV/V + 0.1 V		
(5 to 10) kHz	2 mV/V + 0.5 V		
AC Current – Source <sup>1</sup>	30 to 330) μA		Fluke 5500A Multiproduct Calibrator
	(10 to 20) Hz	2.5 mA/A + 0.15 μA	
	(20 to 45) Hz	1.3 mA/A + 0.15 μA	
	45 Hz to 1 kHz	1.3 mA/A + 0.25 μA	
	(1 to 5) kHz	4 mA/A + 0.15 μA	
	(5 to 10) kHz	12.5 mA/A + 0.15 μA	
	(0.33 to 3.3) mA		
	(10 to 20) Hz	2 mA/A + 0.3 μA	
	(20 to 45) Hz	1 mA/A + 0.3 μA	
	45 Hz to 1 kHz	1 mA/A + 0.3 μA	
	(1 to 5) kHz	2 mA/A + 0.3 μA	
	(5 to 10) kHz	6 mA/A + 0.3 μA	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source <sup>1</sup>	(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 (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 (0.33 to 2.2) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (2.2 to 11) A (45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	2 mA/A + 3 μA 1 mA/A + 3 μA 0.9 mA/A + 3 μA 2 mA/A + 3 μA 6 mA/A + 3 μA 2 mA/A + 20 μA 1 mA/A + 20 μA 900 μA/A + 20 μA 2 mA/A + 50 μA 6 mA/A + 0.1 mA 2 mA/A + 0.3 mA 1 mA/A + 0.3 mA 7.5 mA/A + 0.3 mA 0.6 mA/A + 2 mA 1 mA/A + 2 mA 3.3 mA/A + 2 mA	Fluke 5500A Multiproduct Calibrator
DC Power – Source <sup>1,2</sup> 33 mV to 1 020 V	(3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 11) A	0.04 % of Reading 0.03 % of Reading 0.04 % of Reading 0.03 % of Reading 0.08 % of Reading 0.06 % of Reading 0.12 % of Reading 0.09 % of Reading	Fluke 5500A Multiproduct Calibrator
AC Power – Source <sup>1,2</sup> (45 to 65) Hz PF = 1	(3.3 to 9) mA (33 to 330) mV (0.33 to 1 020) V (9 to 33) mA (33 to 330) mV (0.33 to 1 020) V (33 to 90) mA (33 to 330) mV (0.33 to 1 020) V (90 to 330) mA (33 to 330) mV (0.33 to 1 020) V	0.4 % of Reading 0.25 % of Reading 0.25 % of Reading 0.15 % of Reading 0.35 % of Reading 0.25 % of Reading 0.25 % of Reading 0.15 % of Reading	Fluke 5500A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source <sup>1,2</sup> (45 to 65) Hz PF = 1	(330 to 900) mA (33 to 330) mV (0.33 to 1 020) V 900 mA to 1.5 A (33 to 330) mV (0.33 to 1 020) V (1.5 to 4.5) A (33 to 330) mV (0.33 to 1 020) V (4.5 to 11) A (33 to 330) mV (0.33 to 1 020) V	0.35 % of Reading 0.25 % of Reading 0.25 % of Reading 0.15 % of Reading 0.35 % of Reading 0.2 % of Reading 0.25 % of Reading 0.15 % of Reading	Fluke 5500A Multiproduct Calibrator
Resistance – Source <sup>1</sup>	Up to 11 Ω (11 to 33) Ω (33 to 330) Ω 330 Ω to 3.3 kΩ (3.3 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 3.3 MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ	0.12 mΩ / Ω + 8 mΩ 0.12 mΩ / Ω + 15 mΩ 90 μΩ / Ω + 15 mΩ 90 μΩ / Ω + 60 mΩ 90 μΩ / Ω + 0.6 Ω 0.11 mΩ / Ω + 6 Ω 0.12 mΩ / Ω + 6 Ω 0.15 mΩ / Ω + 55 Ω 0.6 mΩ / Ω + 550 Ω 1 mΩ/Ω + 550 Ω 5 mΩ/Ω + 5.5 kΩ 5 mΩ/Ω + 16.5 kΩ	Fluke 5500A Multiproduct Calibrator
Capacitance – Source <sup>1</sup> 50 Hz to 1 kHz 50 Hz to 1 kHz 50 Hz to 1 kHz 50 Hz to 1 kHz 50 Hz to 1 kHz (50 to 400) Hz (50 to 400) Hz (50 to 200) Hz (50 to 100) Hz (50 to 100) Hz	(0.33 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF (0.33 to 1.1) mF	5 mF/F + 10 pF 2.5 mF/F + 0.1 nF 2.5 mF/F + 0.3 nF 2.5 mF/F + 1 nF 3.5 mF/F + 3 nF 3.5 mF/F + 10 nF 4 mF/F + 30 nF 5 mF/F + 0.1 μF 7 mF/F + 0.3 μF 10 mF/F + 0.3 μF	Fluke 5500A Multiproduct Calibrator
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure <sup>1</sup>	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	Fluke 5500A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure <sup>1</sup>	Type C		Fluke 5500A Multiproduct Calibrator
	(0 to 150) °C	0.3 °C	
	(150 TO 650) °C	0.26 °C	
	(650 TO 1 000) °C	0.31 °C	
	(1 000 TO 1 800) °C	0.5 °C	
	(1 800 TO 2 316) °C	0.84 °C	
	Type E		
	(-250 to -100) °C	0.5 °C	
	(-100 to -25) °C	0.16 °C	
	(-25 to 350) °C	0.14 °C	
	(350 to 650) °C	0.16 °C	
	(650 to 1 000) °C	0.21 °C	
	Type J		
	(-210 to -100) °C	0.27 °C	
	(-100 to -30) °C	0.16 °C	
	(-30 to 150) °C	0.14 °C	
	(150 to 760) °C	0.17 °C	
	(760 to 1 200) °C	0.23 °C	
	Type K		
	(-200 to -100) °C	0.33 °C	
	(-100 to -25) °C	0.18 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.26 °C	
	(1 000 to 1 372) °C	0.4 °C	
	Type L		
	(-200 to -100) °C	0.37 °C	
	(-100 to 800) °C	0.26 °C	
	(800 to 900) °C	0.17 °C	
Type N			
(-200 to -100) °C	0.4 °C		
(-100 to -25) °C	0.22 °C		
(-25 to 120) °C	0.19 °C		
(120 to 410) °C	0.18 °C		
(410 to 1 300) °C	0.27 °C		
Type R			
(0 to 250) °C	0.57 °C		
(250 to 400) °C	0.36 °C		
(400 to 1 000) °C	0.34 °C		
(1 000 to 1 767) °C	0.4 °C		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure <sup>1</sup>	Type S 0 to 250) °C (250 to 1 000) °C (1 000 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 Type U (0 to 600) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C 0.63 °C 0.25 °C 0.17 °C 0.15 °C 0.27 °C	Fluke 5500A Multiproduct Calibrator
Electrical Simulation of RTD Indicating Devices – Source <sup>1</sup>	Pt 385, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C Pt 3916, 100 Ω (-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100-to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 3926, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C 0.25 °C 0.4 °C 0.5 °C 0.6 °C 0.7 °C 0.8 °C 0.9 °C 0.1 °C 0.23 °C 0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Fluke 5500A Multiproduct Calibrator



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Source <sup>1</sup>	Pt 385, 200 Ω		Fluke 5500A Multiproduct Calibrator
	(-200 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.04 °C	
	(100 to 260) °C	0.05 °C	
	(260 to 300) °C	0.12 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.04 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.06 °C	
	(260 to 300) °C	0.08 °C	
	(300 to 400) °C	0.08 °C	
	(400 to 600) °C	0.09 °C	
	(600 to 630) °C	0.11 °C	
	Pt 385, 1 kΩ		
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
(0 to 100) °C	0.04 °C		
(100 to 260) °C	0.05 °C		
(260 to 300) °C	0.06 °C		
(300 to 400) °C	0.07 °C		
(400 to 600) °C	0.07 °C		
(600 to 630) °C	0.23 °C		
Ni 385, 120 Ω			
(-80 to 0) °C	0.08 °C		
(0 to 100) °C	0.08 °C		
(100 to 260) °C	0.14 °C		
Cu 427, 10 Ω			
(-100 to 260) °C	0.3 °C		
Oscilloscopes Amplitude – DC into 50 Ω load into 1 MΩ load Amplitude – Square Wave into 50 Ω load into 1 MΩ load	(0 to ±2.2) V	0.25 % of reading + 0.1 mV	Fluke 5500A - SC300 Multiproduct Calibrator
	(0 to ±33) V	0.25 % of reading + 0.1 mV	
	1.8 mVp-p to 2.2 Vp-p	0.25 % of reading + 0.1 mV	
	1.8 mVp-p to 105 Vp-p	0.25 % of reading + 0.1 mV	





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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes <sup>3</sup> Leveled Sine Wave - Amplitude	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz	2 % of reading + 0.2 mV 3.5 % of reading + 0.3 mV 4 % of reading + 0.3 mV	Fluke 5500A - SC300 Multiproduct Calibrator
Flatness	50 kHz to 100 MHz (100 to 300) MHz	1.5 % of reading + 0.1 mV 2 % of reading + 0.1 mV	
Time Marker	2 ns to 1 $\mu$ s (2 to 50) $\mu$ s 100 $\mu$ s to 5 s	25 $\mu$ s/s (25 + 15 000t) $\mu$ s/s (25 + 1 000t) $\mu$ s/s	
Rise Time	$\leq$ 300 ps	+0/-100 ps	
Sine Wave Flatness – Source	100 kHz to 1.04 GHz	0.05 dB	HP 8657A Signal Generator
Phase – Source <sup>1</sup>	(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.4 ° 1.5 ° 5 ° 6 ° 10 °	Fluke 5500A - SC300 Multiproduct Calibrator
Frequency – Source <sup>1</sup>	0.01 Hz to 1.2 kHz (1.2 to 10) kHz 10 kHz to 2 MHz	25 $\mu$ Hz/Hz + 1 mHz 25 $\mu$ Hz/Hz + 1 mHz 25 $\mu$ Hz/Hz + 15 mHz	Fluke 5500A - SC300 Multiproduct Calibrator
Insulation Tester <sup>1</sup> (DC and AC @ 60 Hz)	Up to 40 kV and 1 000 A	1.1 % of reading	Fluke 45 Digital Multimeter w/ HV Probe, Decade Resistors
Power Supplies, Hypot Testers, Welders <sup>1</sup> (DC and AC @ 60 Hz)	Up to 40 kV and 1 000 A	1 % of reading	Fluke 45 Digital Multimeter or HP 34401 6.5 Digit Multimeter, Current Shunts, Decade Resistors
ESD Mats and Tables <sup>1,2</sup>	All	25 % of Reading	OHM-STAT RT 1000 Decade Resistor

**Length – Dimensional Metrology**

<b>Parameter/Equipment</b>	<b>Range</b>	<b>Expanded Uncertainty of Measurement (+/-)</b>	<b>Reference Standard, Method, and/or Equipment</b>
Surface Plates <sup>1,3</sup> Overall Flatness	Up to 144 in x 144 in	$(11.3 + 0.3D) \mu\text{in}$	GGG-P-463c using Autocollimator
Local Area Flatness (Repeat Readings)	Up to 0.001 in	12 $\mu\text{in}$	Repeat-o-Meter
Bench Micrometers <sup>1,3</sup>	Up to 72 in	$(9.4 + 5.2L) \mu\text{in}$	Grade 1 Gage Blocks, Optical Parallels, Laser
Linear Measuring Machines <sup>1,3</sup>	Up to 72 in	$(9.4 + 5.2L) \mu\text{in}$	Grade 1 Gage Blocks, Optical Parallels, Laser
Optical Comparators Profile Projectors <sup>1,3</sup>	(5 to 60) in Screen X & Y Travel to 12 in	$(75.3 + 2.2L) \mu\text{in}$	Glass Scales, Magnification Scales, Magnification Pins, Precision Balls
Indicators <sup>1,3</sup>	Up to 6 in	$(12 + 1L) \mu\text{in}$	Calibration Tester, MAC-10 Calibrator, Grade 2 Gage Blocks, Surface Plate
Calipers <sup>1,3</sup>	Up to 80 in	$(124.6 + 24L) \mu\text{in}$	Grade 2 Gage Blocks, Ring Gages, Surface Plate
Micrometers <sup>1,3</sup> O.D.& I.D Includes Depth, Point, Ball, Blade, V, Pitch Anvils	(1 to 60) in	$(32.4 + 9.5L) \mu\text{in}$	Grade 2 Gage Blocks, Ring Gages, Surface Plate, Optical Parallels, Ball Gages, Ring Gages, Heidenhain MT25 Linear Probe
Bore (Intramic)	Up to 6 in	68 $\mu\text{in}$	
Mic Heads	Up to 2 in	61 $\mu\text{in}$	
Cylindrical Squares, Steel Blade Magnetic Combination	(2 to 12) in	108 $\mu\text{in}$	Surface Plate, Test Indicator, Angle Plate, Cylindrical Square
Levels, Digital Protractors, Inclinometers <sup>3</sup>	Up to 360°	0.33"	Grade 2 Gage Blocks, Surface Plate, Sine Bar, Autocollimator, Angle Blocks
Optical Flats/Parallels Flatness	(1 to 6) in	2.2 $\mu\text{in}$	6 in Master Flat, Optical Vernier, Gage Block Comparator
Parallelism	Up to 1 in	3.6 $\mu\text{in}$	

**Length – Dimensional Metrology**

<b>Parameter/Equipment</b>	<b>Range</b>	<b>Expanded Uncertainty of Measurement (+/-)</b>	<b>Reference Standard, Method, and/or Equipment</b>
Height Gages <sup>3</sup> Analog	Up to 60 in	290 μin	Grade 2 Gage Blocks, Surface Plate
Digital	Up to 60 in	(10.1 + 7L) μin	
Height Master <sup>1</sup> Riser Blocks Block Stacks	Up to 60 in 10 in and 12 in Up to 48 in	(10.1 + 7L) μin 21 μin (27.6 + 4.3L) μin	Grade 2 Gage Blocks Surface Plate, Electronic Amplifier with Probe
Electronic Gage Dimensional Comparator <sup>1</sup>	Up to 6 in	7.8 μin	Grade 2 Gage Blocks, Surface Plate
Toolmaker's Microscope, Video Scope <sup>1</sup>	X, Y, Z: Up to 12 in	(19 + 4.3L) μin	Glass Scales, Laser
Glass Scales, Stage Micrometers, Steel Rules	(0.001 to 12) in	(15.6 + 2.7L) μin	Mahr Measurement Machine, CCT Microscope
Autocollimator <sup>3</sup>	Up to 60'	0.21"	Autocollimator Calibrator Optical Wedge
Rotary Table Dividing Heads Ultradex <sup>1,3</sup> Rotary	(0 to 360)°	0.5"	Autocollimator, 12-Sided Polygon (30 °)
Tilt	(0 to 90)°	1"	
Coordinate Measuring Machines <sup>1,3</sup>	12 to 72 in	(32.2 + 8.4L) μin	Granite Square, Grade 2 Gage Blocks, Ball Bar
Thread Wires	Up to 1 in	7.6 μin	Light Wave Micrometer, Mikroktor, Master Wires
Ring Gages <sup>3</sup>	(0.125 to 12) in	(15.9 + 2.9L) μin	I.D. Comparator, Mahr Measuring Machine
Plug Gages <sup>3</sup>	(0.005 to 8) in	(8.9 + 1.8L) μin	Bench Micrometer, Mahr Measurement Machine
Gear Wires	(0.005 to 1) in	7.6 μin	Bench Micrometer, Mahr Measurement Machine, Grade 2 Gage Blocks
Thread Ring Gages	Up to 1 in	51 μin	Master Thread Setting Plugs
Polygons <sup>3</sup>	Up to 360°	0.30"	Autocollimator, Ultradex
Thread Plug Gages	Up to 10 in	12 μin	Bench Micrometer, Mahr Measurement Machine, Grade 2 Gage Blocks, Grade A Thread Wire Set

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Ring Setting Master	Up to 10 in	12 $\mu$ in	Bench Micrometer, Mahr Measurement Machine, Wires Grade 2 Gage Blocks
Calibration Testers	Up to 0.2 in	14 $\mu$ in	Laser, Grade 2 Gage Blocks, Heidenhain MT25 Linear Probe
Indicator Calibrators	Up to 2 in	14 $\mu$ in	Laser, Grade 2 Gage Blocks Heidenhain MT50 Linear Probe
Gage Blocks <sup>3</sup>	(0.01 to 0.1) in (0.1001 to 4) in (5 to 20) in	(2.7 + 3.8L) $\mu$ in (2.0 + 3.1L) $\mu$ in (1.8 + 1.7L) $\mu$ in	Laser Comparator, Grades 1 and 2 Gage Blocks, Optical Flat
Crimp Tools	All	43 $\mu$ in	Pin Gages, Point Micrometer
Repeat Reading Gages	All	15 $\mu$ in	Grade 2 Gage Blocks, Surface Plate
Sunnen Gage Setting Fixtures <sup>1</sup>	Up to 4 in	58 $\mu$ in	Grade 2 Gage Blocks, Optical Parallels
Sunnen Gages <sup>1</sup>	(0.375 to 4) in	45 $\mu$ in	Ring Gages
Squares <sup>3</sup> (Granite and Ceramic)	(2 to 24) in	(17.3 + 1.9L) $\mu$ in	Autocollimator, Parallel Mirror, Surface Plate, Optical Square
Straight Edges <sup>3</sup> (Granite and Ceramic)	(6 to 60) in	(14.2 + 2.3L) $\mu$ in	Autocollimator, Parallel Mirror, Surface Plate
Parallels <sup>3</sup> (Granite and Ceramic)	(6 to 60) in	(14.2 + 2.3L) $\mu$ in	Surface Plate, Electronic Amplifier with Probe
Penta Prism Optical Square <sup>3</sup>	90°	0.37"	Autocollimator, Parallel Mirror, Surface Plate
Surface Roughness Gages <sup>1</sup>	(10 to 120) $\mu$ in	5.9 $\mu$ in	Roughness Specimens
Surface Roughness Specimens	RA = (10 to 120) $\mu$ in	3.1 $\mu$ in	Hommel Surface Tester
Torque Ratio Arms/Wheels	(1 to 60) in	(22.7 + 9.8L) $\mu$ in	Surface Plate, Gage Blocks, Amp w/ Probe

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers <sup>1</sup>	HRA		Indirect verification per ASTM E18 using Hardness Blocks.
	Low	1.14 HRA	
	Middle	1.1 HRA	
	High	1.08 HRA	
	HRBW		
	Low	1.49 HRBW	
	Middle	1.26 HRBW	
	High	1.18 HRBW	
	HRC		
	Low	1.14 HRC	
	Middle	1.29 HRC	
	High	1.18 HRC	
	HRE		
	Low	1.22 HRE	
	Middle	1.2 HRE	
	High	1.2 HRE	
	HRHW		
	Low	1.15 HRHW	
	High	1.15 HRHW	
	HR15N		
	Low	1.16 HR15N	
	Middle	1.09 HR15N	
	High	1.09 HR15N	
	HR30N		
Low	1.18 HR30N		
Middle	1.16 HR30N		
High	1.3 HR30N		
HR45N			
Low	1.17 HR45N		
Middle	1.29 HR45N		
High	1.08 HR45N		
HR15TW			
Low	1.20 HR15TW		
Middle	1.13 HR15TW		
High	1.12 HR15TW		
HR30TW			
Low	1.23 HR30TW		
Middle	1.13 HR30TW		
High	1.11 HR30TW		

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers <sup>1</sup>	HR45TW Low Middle High	1.23 HR45TW 1.27 HR45TW 1.14 HR45TW	Indirect verification per ASTM E18 using Hardness Blocks.
Vickers Hardness Testers <sup>1</sup>	HV 100 gf 500 gf 1 000 gf	28.3 HV 12.9 HV 6.7 HV	Indirect verification per ASTM E92 using Hardness Blocks.
Knoop Hardness Testers <sup>1</sup>	HK 100 gf 500 gf 1 000 gf	37.5 HK 19.4 HK 10 HK	
Durometer/Shore Hardness Tester – Force Only <sup>1</sup> Type A, D, M	Up to 100 duro	0.72 duro	Direct Verification per ASTM D2240 using Gage Blocks and Digital Force Gage/Fixture.
Force Gages <sup>1</sup>	Up to 100 g 100 to 500 g 500 g to 5 kg (5 to 25) kg	0.3 mg 1.8 mg 12.2 mg 0.19 g	Class F Weights, Master Load Cells
Load Cells	Up to 500 lb (500 to 2 000) lb (2 000 to 10 000) lb	0.07 % of reading 0.06 % of reading + 0.5 lb 0.07 % of reading + 0.5 lb	Class F Weights, Master Load Cells
Scales and Balances <sup>1</sup> (0.000 1 g resolution)	Up to 100 g	0.3 mg	OIML Class M1 Weights and NIST HB 44 utilized in the calibration of the weighing system.
Scales and Balances <sup>1</sup> (0.001 g resolution)	(100 to 500) g	1.8 mg	
Scales and Balances <sup>1</sup> (0.01 g resolution)	500 g to 5 kg	12.2 mg	
Scales and Balances <sup>1</sup> (0.1 g resolution)	(5 to 25) kg	0.19 g	
Scales and Balances <sup>1</sup> (0.1 lb resolution)	0 to 500 lb	1.7 g	NIST Class F Weights and NIST HB 44 utilized in the calibration of the weighing system.
Mass Artifacts	Up to 100 g	0.22 mg	OIML Class M1 Weights, HR-202 Balance
	(100 to 500) g	1.7 mg	OIML Class M1 Weights, SETRA 500C Balance
	500 g to 5 kg	11.9 mg	OIML Class M1 Weights, SETRA 5000C Balance

### Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Artifacts	(5 to 20) kg	123.8 mg	OIML Class M1 Weights, SETRA SUPER II Balance
Torque Tools <sup>1</sup>	0.1 ozf·in to 1 200 lbf·ft	1 % of reading	Waters Torque Watch Calibrator, Digital Torque Calibrator, Load Cells
Torque Calibrators	0.1 ozf·in to 1 200 lbf·ft	0.5 % of reading	Torque Arms, NIST Class F Weights
Pressure Gages <sup>1</sup>	Up to 500 psi Up to 5 000 psi Up to 10 000 psi	0.03 % of reading 0.1 % of reading 0.1 % of reading	Fluke Master Pressure Gages, Omega DRO w/ Pressure Transducer
Vacuum Gages <sup>1</sup>	(-25 to 0) inHg	0.03 % of reading	

### Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Ovens, Environmental Chambers, Freezers, Temperature Baths <sup>1</sup>	(0 to 2 501) °F (0 to 100) °C	2.9 °F 0.22 °C	Data Logger, Thermocouple Calibrator, Lab Thermometer
Temperature Controllers	(32 to 752) °F	0.43 °F	Lab Oven Thermocouple Calibrator
Thermometers <sup>1</sup>	(0 to 400) °C	0.24 °C	Fluke/Hart 1502, Omega PRT, Heat Source
Infrared Thermometers <sup>5</sup>	Ambient to 900 °F	0.45 % of reading + 0.86 °F	Thermoworks IR-500 Black Body (flat plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$
Thermocouples	Ambient to 1 000 °F Ambient to 538 °C	1.3 °F 0.73 °C	Lab Oven, Thermocouple Calibrator, Hart Fluke 1502A w/PRT, Temperature Bath, Fluke 5500 Multiproduct Calibrator
Humidity – Source (Fixed Points) (relative to 25 °C)	11.3 %RH 32.8 %RH 75.3 %RH 97.3 %RH	2 % of reading 2 % of reading 2 % of reading 3 % of reading	Chamber w/ Accredited Salt Solutions
Humidity – Measure <sup>1</sup>	(5 to 95) %RH	4 %RH	Digital Psychrometer



**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches & Timers <sup>1</sup> Analog	Up to 48 hr	0.86 s/24 hr	Comparison to Quartz Standard Stopwatch.
Digital	Up to 48 hr	5.2 s/24 hr	
Photo Tachometers	Up to 100 000 rpm	0.003 5 % of reading	HP 34401A 6.5 Digit Multimeter, Wavetek 171 Signal Generator
Mechanical Tachometers	(10 to 1 000) rpm (1000 to 6 000) rpm	0.05 % of reading + 2 rpm 0.05 % of reading + 1 rpm	Comparison to a Digital Photo Tachometer.

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. Uncertainty is stated in % of reading in units of Watts (W).
3.  $t$  = time in seconds;  $L$  = length in inches; ' = arc-minute; " = arc-second.
4. Uncertainty is stated in percent of reading in units of  $\Omega$  (Ohm).
5. Resolution of the Device Under Test will be included in the Measurement Uncertainty (MU) at the time of calibration.
6. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1376.



R. Douglas Leonard Jr., VP, PILR SBU