



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.

Jason Stine, Vice President

Expiry Date: 13 February 2027

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

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CALIBRATION

ISO/IEC 17025 Accreditation Granted: **13 February 2025**

Certificate Number: **AC-1376**

Certificate Expiry Date: **13 February 2027**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	(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 μ V/V + 1 μ V 4 μ V/V + 3 μ V 4 μ V/V + 30 μ V 4.5 μ V/V + 0.3 mV 4.5 μ V/V + 0.9 mV	Comparison to Fluke 5500A Multiproduct Calibrator
DC Current – Source ¹	(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 μ A 0.1 mA/A + 3.3 μ A 0.3 mA/A + 44 μ A 0.6 mA/A + 0.33 mA	Comparison to Fluke 5500A Multiproduct Calibrator
AC Voltage – Source ¹	(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 mV/V + 20 μ V 1.5 mV/V + 20 μ V 2 mV/V + 20 μ V 2.5 mV/V + 20 μ V 3.5 mV/V + 33 μ V 10 mV/V + 60 μ V	Comparison to Fluke 5500A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	(33 to 330) mV		Comparison to 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 ¹	(30 to 330) μA		Comparison to 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	

Electrical – DC/Low Frequency

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

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source ^{1,2} (45 to 65) Hz PF = 1	(330 to 900) mA	0.35 % of reading	Comparison to Fluke 5500A Multiproduct Calibrator
	(33 to 330) mV (0.33 to 1 020) V	0.25 % of reading	
	900 mA to 1.5 A (33 to 330) mV (0.33 to 1 020) V	0.25 % of reading 0.15 % of reading	
	(1.5 to 4.5) A (33 to 330) mV (0.33 to 1 020) V	0.35 % of reading 0.2 % of reading	
	(4.5 to 11) A (33 to 330) mV (0.33 to 1 020) V	0.25 % of reading 0.15 % of reading	
Resistance – Source ¹	Up to 11 Ω	0.12 mΩ / Ω + 8 mΩ	Comparison to Fluke 5500A Multiproduct Calibrator
	(11 to 33) Ω	0.12 mΩ / Ω + 15 mΩ	
	(33 to 330) Ω	90 μΩ / Ω + 15 mΩ	
	330 Ω to 3.3 kΩ	90 μΩ / Ω + 60 mΩ	
	(3.3 to 33) kΩ	90 μΩ / Ω + 0.6 Ω	
	(33 to 110) kΩ	0.11 mΩ / Ω + 6 Ω	
	(110 to 330) kΩ	0.12 mΩ / Ω + 6 Ω	
	330 kΩ to 3.3 MΩ	0.15 mΩ / Ω + 55 Ω	
	(3.3 to 11) MΩ	0.6 mΩ / Ω + 550 Ω	
	(11 to 33) MΩ	1 mΩ/Ω + 550 Ω	
(33 to 110) MΩ	5 mΩ/Ω + 5.5 kΩ		
(110 to 330) MΩ	5 mΩ/Ω + 16.5 kΩ		
Capacitance – Source ¹	50 Hz to 1 kHz		Comparison to Fluke 5500A Multiproduct Calibrator
	(0.33 to 11) nF	5 mF/F + 10 pF	
	(11 to 110) nF	2.5 mF/F + 0.1 nF	
	(110 to 330) nF	2.5 mF/F + 0.3 nF	
	(0.33 to 1.1) μF	2.5 mF/F + 1 nF	
	(1.1 to 3.3) μF	3.5 mF/F + 3 nF	
	(50 to 400) Hz		
	(3.3 to 11) μF	3.5 mF/F + 10 nF	
	(11 to 33) μF	4 mF/F + 30 nF	
	(50 to 200) Hz		
(33 to 110) μF	5 mF/F + 0.1 μF		
(50 to 100) Hz			
(110 to 330) μF	7 mF/F + 0.3 μF		
(0.33 to 1.1) mF	10 mF/F + 0.3 μF		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
<p>1 Electrical Simulation of Thermocouple Indicating Devices – Source/Measure 1</p>	Type B		<p>Comparison to Fluke 5500A Multiproduct Calibrator Comparison to</p>
	(600 to 800) °C	0.44 °C	
	(800 to 1 000) °C	0.34 °C	
	(1 000 to 1 550) °C	0.3 °C	
	(1 550 to 1 820) °C	0.33 °C	
	Type C		
	(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		

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 ¹	Type R		Comparison to Fluke 5500A Multiproduct Calibrator
	(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	
	Type S		
	0 to 250) °C	0.47 °C	
	(250 to 1 000) °C	0.36 °C	
	(1 000 to 1 400) °C	0.37 °C	
	(1 400 to 1 767) °C	0.46 °C	
	Type T		
	(-250 to -150) °C	0.63 °C	
	(-150 to 0) °C	0.25 °C	
(0 to 120) °C	0.17 °C		
(120 to 400) °C	0.15 °C		
Type U			
(0 to 600) °C	0.27 °C		
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 100 Ω		Comparison to Fluke 5500A Multiproduct Calibrator
	(-200 to -80) °C	0.05 °C	
	(-80 to 0) °C	0.05 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 300) °C	0.09 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 630) °C	0.12 °C	
	(630 to 800) °C	0.23 °C	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.25 °C	
	(-190 to -80) °C	0.4 °C	
	(-80 to 0) °C	0.5 °C	
	(0 to 100) °C	0.6 °C	
	(100-to 260) °C	0.7 °C	
	(260 to 300) °C	0.8 °C	
	(300 to 400) °C	0.9 °C	
	(400 to 600) °C	0.1 °C	
	(600 to 630) °C	0.23 °C	



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Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 3926, 100 Ω		
	(-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, 200 Ω		
	(-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	
			Comparison to Fluke 5500A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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 to ± 33) V 1.8 mVp-p to 2.2 Vp-p 1.8 mVp-p to 55 Vp-p	0.25 % of reading + 0.1 mV 0.25 % of reading + 0.1 mV 0.25 % of reading + 0.1 mV 0.25 % of reading + 0.1 mV	Comparison to Fluke 5500A - SC300 Multiproduct Calibrator
Oscilloscopes ³ Leveled Sine Wave - Amplitude Flatness Time Marker Edge-Rise Time	5 mVp-p to 5.5 Vp-p 50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz 50 kHz to 100 MHz (100 to 300) MHz 2 ns to 1 μs (2 to 50) μs 100 μs to 5 s 1 kHz to 1 MHz ≤ 2 ns (50 Ω, 1Vp-p)	2 % of reading + 0.2 mV 3.5 % of reading + 0.3 mV 4 % of reading + 0.3 mV 1.5 % of reading + 0.1 mV 2 % of reading + 0.1 mV 25 μs/s (25 + 15 000t) μs/s (25 + 1 000t) μs/s +0/-30 ps	Comparison to Fluke 5500A - SC300 Multiproduct Calibrator
Sine Wave Flatness – Source	(-143 to 13) dBm 100 kHz to 1.04 GHz	1 dB	Comparison to HP 8657A Signal Generator
Phase – Source ¹	(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°	Comparison to Fluke 5500A Multiproduct Calibrator
Power Supplies, Welders ¹ (DC and AC @ 60 Hz) Voltage Current	Up to 40 kV Up to 1 kA	1 % of reading 1 % of reading	Comparison to Digital Multimeter with High Voltage Probe Current Shunts

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
ESD Mats and Tables ^{1,2}	10 V 100 kΩ to 100 MΩ/sq	25 % of reading	Comparison to OHM-STAT RT 1000
	100 V 10 MΩ to 1 TΩ/sq	25 % of reading	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Surface Plates ^{1,3} Overall Flatness	Up to 204 inDL	$(11.3 + 0.3\sqrt{DL}) \mu\text{in}$	GGG-P-463c using Autocollimator
Local Area Flatness (Repeat Readings)	Up to 0.05 in	12 μin	Repeat-o-Meter
Bench Micrometers ^{1,3}	Up to 72 in	$(9.4 + 5.2L) \mu\text{in}$	Comparison to Grade 1 Gage Blocks, Optical Parallels, TESA Electronic Length Measuring Equipment
Linear Measuring Machines ^{1,3}	Up to 72 in	$(9.4 + 5.2L) \mu\text{in}$	Comparison to Grade 1 Gage Blocks, Optical Parallels, TESA Electronic Length Measuring Equipment
Optical Comparators Profile Projectors ^{1,3}	(5 to 60) in Screen X & Y Travel to 12 in	$(76 + 2.2L) \mu\text{in}$	Comparison to Glass Scales, Magnification Scales, Magnification Pins, Precision Balls
Indicators ^{1,3}	Up to 6 in	$(12 + 1L) \mu\text{in}$	Comparison to Calibration Tester, MAC-10 Calibrator, Grade 2 Gage Blocks, Surface Plate
Calipers ^{1,3}	Up to 80 in	$(130 + 24L) \mu\text{in}$	Comparison to Grade 2 Gage Blocks, Ring Gages, Surface Plate

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers ^{1,3} O.D.& I.D Includes Depth, Point, Ball, Blade, V, Pitch Anvils Bore (Intramic) Mic Heads	Up to 60 in Up to 6 in Up to 2 in	(33 + 9.5L) μin 68 μin 61 μin	Comparisons to Grade 2 Gage Blocks, Ring Gages, Surface Plate, Optical Parallels, Ball Gages, Ring Gages, Heidenhain MT25 Linear Probe
Cylindrical Squares, Steel Blade Magnetic Combination	(2 to 12) in	110 μin	Comparison to Surface Plate, Test Indicator, Angle Plate, Cylindrical Square
Levels, Digital Protractors, Inclinometers ³	Up to 360°	0.33"	Comparison to Grade 2 Gage Blocks, Surface Plate, Sine Bar, Autocollimator, Angle Blocks
Optical Flats/Parallels Flatness Parallelism	(1 to 6) in Up to 1 in	2.2 μin 3.6 μin	Comparison to 6 in Master Flat, Optical Vernier, Gage Block Comparator
Height Gages ³ Analog Digital	Up to 60 in Up to 60 in	290 μin (10 + 7L) μin	Comparison to Grade 2 Gage Blocks, Surface Plate
Height Master ¹ Riser Blocks Block Stacks	Up to 60 in 6 in and 12 in Up to 48 in	(10 + 7L) μin 21 μin (28 + 4.3L) μin	Comparison to Grade 2 Gage Blocks Surface Plate, Electronic Amplifier with Probe
Electronic Gage Dimensional Comparator ¹	Up to 6 in	7.8 μin	Comparison to Grade 2 Gage Blocks, Surface Plate
Toolmaker's Microscope, Video Scope ¹	X, Y, Z: Up to 12 in	(19 + 4.3L) μin	Comparison to Glass Scales, TESA Electronic Length Measuring Equipment

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Glass Scales, Stage Micrometers, Steel Rules	(0.001 to 12) in	$(16 + 2.7L) \mu\text{in}$	Comparison to Mahr Measurement Machine, CCT Microscope
Autocollimator ³	Up to 60'	0.21"	Comparison to Autocollimator Calibrator Optical Wedge
Rotary Table Dividing Heads Ultradex ^{1,3} Rotary Tilt	(0 to 360)° (0 to 90)°	0.5" 1"	Comparison to Autocollimator, 12-Sided Polygon (30 °)
Coordinate Measuring Machines ^{1,3}	1D: Up to 72 in	$(33 + 8.4L) \mu\text{in}$	Comparison to Granite Square, Grade 2 Gage Blocks, Ball Bar
Thread Wires	Up to 1 in	7.6 μin	Mahr Measurement Machine, Master Wires, Gage Blocks
Ring Gages ³ Inside Diameter	(0.125 to 12) in	$(16 + 2.9L) \mu\text{in}$	Comparison to I.D. Comparator, Gage Blocks
Plug Gages ³ Outside Diameter	(0.005 to 8) in	$(8.9 + 1.8L) \mu\text{in}$	Comparison to Mahr Measurement Machine, Gage Blocks
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	Tactile Fit using Master Thread Setting Plugs
Polygons ³	Up to 360°	0.30"	Comparison to Autocollimator, Ultradex

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gages	Up to 10 in	12 μ in	Comparison to Bench Micrometer, Mahr Measurement Machine, Grade 2 Gage Blocks, Grade A Thread Wire Set
Thread Ring Setting Master	Up to 10 in	12 μ in	Comparison to Bench Micrometer, Mahr Measurement Machine, Wires, Grade 2 Gage Blocks
Calibration Testers	Up to 0.2 in	14 μ in	Comparison to TESA Electronic Length Measuring Equipment, Grade 2 Gage Blocks, Heidenhain MT25 Linear Probe
Indicator Calibrators	Up to 2 in	14 μ in	Comparison to TESA Electronic Length Measuring Equipment, Grade 2 Gage Blocks, Heidenhain MT50 Linear Probe
Gage Blocks ³	(0.01 to 0.1) in (0.100 1 to 4) in (5 to 20) in	(2.7 + 3.8L) μ in (2.0 + 3.1L) μ in (1.8 + 1.7L) μ in	Comparison to TESA Electronic Length Measuring Equipment, Grades 1 and Grade 2 Gage Blocks
Crimp Tools	Up to 0.25 in	43 μ in	Comparison to Pin Gages, Outside Micrometer
Repeat Reading Gages	Up to 0.025 in	15 μ in	Comparison to Calibration Tester
Sunnen Gage Setting Fixtures ¹	Up to 4 in	58 μ in	Comparison to Grade 2 Gage Blocks, Optical Parallels
Sunnen Gages ¹	(0.375 to 4) in	45 μ in	Comparison to Ring Gages

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Squares ³ (Granite and Ceramic)	(2 to 24) in	$(18 + 1.9L) \mu\text{in}$	Comparison to Autocollimator, Parallel Mirror, Surface Plate, Optical Square
Straight Edges ³ (Granite and Ceramic)	(6 to 60) in	$(15 + 2.3L) \mu\text{in}$	Comparison to Autocollimator, Parallel Mirror, Surface Plate
Parallels ³ (Granite and Ceramic)	(6 to 60) in	$(15 + 2.3L) \mu\text{in}$	Comparison to Surface Plate, Electronic Amplifier with Probe
Penta Prism Optical Square ³	90°	0.37"	Comparison to Autocollimator, Parallel Mirror, Surface Plate
Surface Roughness Gages ¹	Up to 120 μin	5.9 μin	Comparison to Roughness Specimens
Surface Roughness Specimens Ra	Up to 120 μin	3.1 μin	Comparison to Shef Surface Tester
Torque Ratio Arms/Wheels	(1 to 60) in	$(23 + 9.8L) \mu\text{in}$	Comparison to 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 ¹	HRA		Indirect verification per ASTM E18 using Hardness Blocks.
	Low	1.2 HRA	
	Middle	1.1 HRA	
	High	1.1 HRA	
	HRBW		
	Low	1.5 HRBW	
	Middle	1.3 HRBW	
	High	1.2 HRBW	
	HRC		
	Low	1.2 HRC	
	Middle	1.3 HRC	
	High	1.2 HRC	
	HRE		
	Low	1.3 HRE	
	Middle	1.2 HRE	
	High	1.2 HRE	
	HRHW		
	Low	1.2 HRHW	
	High	1.2 HRHW	
	HR15N		
	Low	1.2 HR15N	
	Middle	1.1 HR15N	
	High	1.1 HR15N	
	HR30N		
Low	1.2 HR30N		
Middle	1.2 HR30N		
High	1.3 HR30N		
HR45N			
Low	1.2 HR45N		
Middle	1.3 HR45N		
High	1.1 HR45N		
HR15TW			
Low	1.2 HR15TW		
Middle	1.2 HR15TW		
High	1.2 HR15TW		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers ¹	HR30TW Low Middle High HR45TW Low Middle High	1.3 HR30TW 1.2 HR30TW 1.2 HR30TW 1.3 HR45TW 1.3 HR45TW 1.2 HR45TW	Indirect verification per ASTM E18 using Hardness Blocks.
Vickers Hardness Testers ¹	HV Up to 1 000 HV	6.7 HV	Indirect verification per ASTM E92 using Hardness Blocks.
Knoop Hardness Testers ¹	HK Up to 1 000 HV	10 HK	Indirect verification per ASTM E92 using Hardness Blocks.
Durometer/Shore Hardness Tester – Force Only ¹ Type A, D, M	Up to 100 duro	0.72 duro	Partial Verification per ASTM D2240 using Gage Blocks and Digital Force Gage/Fixture.
Force Gages ¹	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	Comparison to 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	Comparison to Class F Weights, Master Load Cells
Scales and Balances ¹ (0.000 1 g resolution)	Up to 100 g	0.3 mg	OIML Class M1 weights and NIST HB 44 are utilized in the calibration of the weighing system.
Scales and Balances ¹ (0.001 g resolution)	(100 to 500) g	1.8 mg	OIML Class M1 weights and NIST HB 44 are utilized in the calibration of the weighing system.
Scales and Balances ¹ (0.01 g resolution)	500 g to 5 kg	13 mg	OIML Class M1 weights and NIST HB 44 are utilized in the calibration of the weighing system.

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances ¹ (0.1 g resolution)	(5 to 25) kg	0.19 g	OIML Class M1 weights and NIST HB 44 are utilized in the calibration of the weighing system.
Scales and Balances ¹ (0.1 lb resolution)	Up 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	Comparison to OIML Class M1 Weights using HR-202 Balance
	(100 to 500) g	1.7 mg	Comparison to OIML Class M1 Weights using SETRA 500C Balance
	500 g to 5 kg	12 mg	Comparison to OIML Class M1 Weights using SETRA 5000C Balance
Mass Artifacts	(5 to 20) kg	0.13 g	Comparison to OIML Class M1 Weights using SETRA SUPER II Balance
Torque Tools ¹	0.1 ozf·in to 1 200 lbf·ft	1 % of reading	Comparison to Waters Torque Watch Calibrator, Digital Torque Calibrator, Load Cells
Torque Calibrators	0.1 ozf·in to 1 200 lbf·ft	0.5 % of reading	Comparison to Torque Arms, NIST Class F Weights
Pressure Gages ¹	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	Comparison to Fluke Master Pressure Gages, Omega DRO w/ Pressure Transducer

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Vacuum Gages ¹	(-25 to 0) inHg	0.03 % of reading	Comparison to Fluke Master Pressure Gages, Omega DRO w/ Pressure Transducer

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Ovens, Environmental Chambers, Freezers, Temperature Baths ¹	(0 to 2 501) °F (0 to 100) °C	2.9 °F 0.22 °C	Comparison to Data Logger, Thermocouple Calibrator, Lab Thermometer
Temperature Controllers	(32 to 752) °F	0.43 °F	Comparison to Lab Oven Thermocouple Calibrator
Thermometers ¹	(0 to 400) °C	0.24 °C	Comparison to Fluke/Hart 1502, Indicator with PRT, Heat Source
Infrared Thermometers ⁴	({Ambient + 20} to 932) °F	0.83 % of reading + 5.2 °F	Comparison to Thermoworks IRK-2 & IRK-500 / Omega BB703 Black Body (flat plate) $\epsilon = 0.99, \lambda = (8 \text{ to } 14) \mu\text{m}$
Thermocouple Devices	Ambient to 1 000 °F Ambient to 538 °C	1.3 °F 0.73 °C	Comparison to Lab Oven, Thermocouple Calibrator, Hart Fluke 1502A Indicator with PRT, Temperature Bath, Fluke 5500 Multiproduct Calibrator
Humidity – Source ⁵ (Fixed Points) (relative to 25 °C)	33.07 %RH 54.38 %RH 75.47 %RH	2 % of reading 2 % of reading 3 % of reading	Comparison to Chamber with Thermohygrometer and Salt Solutions

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure ¹	(10 to 90) %RH	4 %RH	Comparison to Thermohygrometer

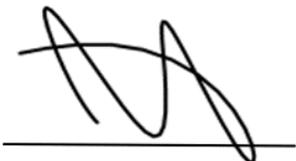
Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches & Timers ¹	Up to 48 hr	0.11 s	Comparison to Quartz Standard Stopwatch.
Photo Tachometers ³	(60 to 99 999) rpm	0.003 6 % of reading + 1.2 rpm	Comparison to HP 34401A 6.5 Digit Multimeter, Wavetek 171 Signal Generator
Mechanical Tachometers ³	(10 to 1 000) rpm (1 000 to 6 000) rpm	0.05 % of reading + 2 rpm 0.05 % of reading + 1 rpm	Comparison to Digital Photo Tachometer.
Frequency – Source ¹	0.01 Hz to 1.2 kHz (1.2 to 10) kHz 10 kHz to 2 MHz	25 μHz/Hz + 1 mHz 25 μHz/Hz + 1 mHz 25 μHz/Hz + 15 mHz	Comparison to Fluke 5500A - SC300 Multiproduct Calibrator

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; DL = diagonal length; ' = arc-minute; " = arc-second; rpm = revolutions per minute.
4. Resolution of the Device Under Test will be included in the Measurement Uncertainty (MU) at the time of calibration.
5. The values present in the Range column are Nominal values. The actual setpoint value at the time of calibration will be reported with the tolerance and the associated Measurement Uncertainty (MU). The Nominal at 33.07 %RH can vary by ± 0.18 %RH; 54.38 %RH can vary by 0.23 %RH; and 75.47 %RH can vary by 0.14 %RH.
6. Unless otherwise specified in the far-right column, the calibration procedure/method was written internally.



Jason Stine, Vice President