CERTIFICATE OF ACCREDITATION

ANSI National Accreditation Board
11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

Cornerstone Metrology Service Inc.
7625 Hayvenhurst Ave. #20
Van Nuys, CA 91406

has been assessed by ANAB and meets the requirements of international standard

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002) and
ANSI/NCSL Z540.3-2006 (R2013)

while demonstrating technical competence in the field of

CALIBRATION

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

AC-1376
Certificate Number

ANAB Approval

Certificate Valid Through: 02/19/2021
Version No. 004 Issued: 02/08/2019

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).

ANSI National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017, ANSI/NCSL Z540-1-1994 (R2002), AND ANSI/NCSL Z540.3-2006 (R2013)

Cornerstone Metrology Service Inc.
7625 Hayvenhurst Ave. #20
Van Nuys, CA 91406
Keith Chauvie
818-902-9551

CALIBRATION

Valid to: **February 19, 2021** Certificate Number: **AC-1376**

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 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1 020) V	5 µV/V + 1 µV 4 µV/V + 3 µV 4 µV/V + 30 µV 4.5 µV/V + 300 µV 4.5 µV/V + 900 µV	Fluke 5500A
DC Current – Source [1]	0 to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 2.2 A (2.2 to 11) A	130 µA/A + 50 nA 100 µA/A + 250 nA 100 µA/A + 3.3 µA 300 µA/A + 44 µA 600 µA/A + 330 µA	
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 mA/A + 20 µV 1.5 mA/A + 20 µV 2 mA/A + 20 µV 2.5 mA/A + 20 µV 3.5 mA/A + 33 µV 10 mA/A + 60 µV	Fluke 5500A
	(33 to 330) 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	 2.5 mV/ V + 50 µV 500 µV/V + 20 µV 1 mV/V + 20 µV 1.6 mV/V + 40 µV 2.4 mV/V + 170 µV 7 mV/V + 330 µV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	**330 mV to 3.3 V**		Fluke 5500A
	(10 to 45) Hz	1.5 mV/V + 250 µV
	45 Hz to 10 kHz	300 µV/V + 60 µV
	(10 to 20) kHz	800 µV/V + 60 µV
	(20 to 50) kHz	1.4 mV/V + 300 µV
	(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	400 µV/V + 600 µV
	(10 to 20) kHz	800 µV/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	500 µV/V + 6.6 mV
	(1 to 10) kHz	800 µV/V + 15 mV
	(10 to 20) kHz	900 µV/V + 33 mV
	(330 to 1 020) V	
	45 Hz to 1 kHz	500 µV/V + 80 mV
	(1 to 5) kHz	2 mV/V + 100 mV
	(5 to 10) kHz	2 mV/V + 500 mV
AC Current – Source [1]	**(30 to 330) µA**		Fluke 5500A
	(10 to 20) Hz	2.5 mA/A + 150 nA
	(20 to 45) Hz	1.3 mA/A + 150 nA
	45 Hz to 1 kHz	1.3 mA/A + 250 nA
	(1 to 5) kHz	4 mA/A + 150 nA
	(5 to 10) kHz	12.5 mA/A + 150 nA
	330 µA to 3.3 mA	
	(10 to 20) Hz	2 mA/A + 300 nA
	(20 to 45) Hz	1 mA/A + 300 nA
	45 Hz to 1 kHz	1 mA/A + 300 nA
	(1 to 5) kHz	2 mA/A + 300 nA
	(5 to 10) kHz	6 mA/A + 300 nA
	(3.3 to 33) mA	
	(10 to 20) Hz	2 mA/A + 3 µA
	(20 to 45) Hz	1 mA/A + 3 µA
	45 Hz to 1 kHz	900 µA/A + 3 µA
	(1 to 5) kHz	2 mA/A + 3 µA
	(5 to 10) kHz	6 mA/A + 3 µA

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source [1]	**330 mV to 3.3 V**		Fluke 5500A
	(10 to 45) Hz	1.5 mV/V + 250 µV	
	45 Hz to 10 kHz	300 µV/V + 60 µV	
	(10 to 20) kHz	800 µV/V + 60 µV	
	(20 to 50) kHz	1.4 mV/V + 300 µV	
	(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	400 µV/V + 600 µV	
	(10 to 20) kHz	800 µV/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	500 µV/V + 6.6 mV	
	(1 to 10) kHz	800 µV/V + 15 mV	
	(10 to 20) kHz	900 µV/V + 33 mV	
	(330 to 1 020) V		
	45 Hz to 1 kHz	500 µV/V + 80 mV	
	(1 to 5) kHz	2 mV/V + 100 mV	
	(5 to 10) kHz	2 mV/V + 500 mV	
AC Current – Source [1]	**(30 to 330) µA**		Fluke 5500A
	(10 to 20) Hz	2.5 mA/A + 150 nA	
	(20 to 45) Hz	1.3 mA/A + 150 nA	
	45 Hz to 1 kHz	1.3 mA/A + 250 nA	
	(1 to 5) kHz	4 mA/A + 150 nA	
	(5 to 10) kHz	12.5 mA/A + 150 nA	
	330 µA to 3.3 mA		
	(10 to 20) Hz	2 mA/A + 300 nA	
	(20 to 45) Hz	1 mA/A + 300 nA	
	45 Hz to 1 kHz	1 mA/A + 300 nA	
	(1 to 5) kHz	2 mA/A + 300 nA	
	(5 to 10) kHz	6 mA/A + 300 nA	
	(3.3 to 33) mA		
	(10 to 20) Hz	2 mA/A + 3 µA	
	(20 to 45) Hz	1 mA/A + 3 µA	
	45 Hz to 1 kHz	900 µA/A + 3 µA	
	(1 to 5) kHz	2 mA/A + 3 µA	
	(5 to 10) kHz	6 mA/A + 3 µA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	**(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	 2 mA/A + 20 µA 1 mA/A + 20 µA 900 µA/A + 20 µA 2 mA/A + 50 µA 6 mA/A + 100 µA	Fluke 5500A
	330 mA to 2.2 A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	 2 mA/A + 300 µA 1 mA/A + 300 µA 7.5 mA/A + 300 µA	
	(2.2 to 11) A (45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	 600 µA/A + 2 mA 1 mA/A + 2 mA 3.3 mA/A + 2 mA	
DC Power – Source [1] 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 900 mA to 2.2 A (2.2 to 4.5) A (4.5 to 11) A	0.04 % of Watts output 0.03 % of Watts output 0.04 % of Watts output 0.03 % of Watts output 0.08 % of Watts output 0.06 % of Watts output 0.12 % of Watts output 0.09 % of Watts output	Fluke 5500A
AC Power – Source [1] (45 to 65) Hz	**(3.3 to 9) mA** (33 to 330) mV 330 mV to 1 020 V	 0.4 % of Watts output 0.25 % of Watts output	Fluke 5500A
	(9 to 33) mA (33 to 330) mV 330 mV to 1 020 V	 0.25 % of Watts output 0.15 % of Watts output	
	(33 to 90) mA (33 to 330) mV 330 mV to 1 020 V	 0.35 % of Watts output 0.25 % of Watts output	
	(90 to 330) mA (33 to 330) mV 330 mV to 1 020 V	 0.25 % of Watts output 0.15 % of Watts output	
	(330 to 900) mA (33 to 330) mV 330 mV to 1 020 V	 0.35 % of Watts output 0.25 % of Watts output	
	900 mA to 1.5 A (33 to 330) mV 330 mV to 1 020 V	 0.25 % of Watts output 0.15 % of Watts output	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source [1] (45 to 65) Hz	**(1.5 to 4.5) A** (33 to 330) mV 330 mV to 1 020 V	0.35 % of Watts output 0.2 % of Watts output	Fluke 5500A
	(4.5 to 11) A (33 to 330) mV 330 mV to 1 020 V	0.25 % of Watts output 0.15 % of Watts output	
Resistance – Source [1]	0 to 11 Ω	120 µΩ / Ω + 8 mΩ	Fluke 5500A
	(11 to 33) Ω	120 µΩ / 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 + 600 mΩ	
	(33 to 110) kΩ (110 to 330) kΩ	110 µΩ / Ω + 6 Ω 120 µΩ / Ω + 6 Ω	
	330 kΩ to 3.3 MΩ	150 µΩ / Ω + 55 Ω	
	(3.3 to 11) MΩ	600 µΩ / Ω + 550 Ω	
	(11 to 33) MΩ	1 mΩ/Ω + 550 Ω	
	(33 to 110) MΩ (110 to 330) MΩ	5 mΩ/Ω + 5.5 kΩ 5 mΩ/Ω + 16.5 kΩ	
Capacitance – Source [1] 50 Hz to 1 kHz	330 pF to 11 nF	5 mF/F + 10 pF	Fluke 5500A
50 Hz to 1 kHz	(11 to 110) nF	2.5 mF/F + 100 pF	
50 Hz to 1 kHz	(110 to 330) nF	2.5 mF/F + 300 pF	
50 Hz to 1 kHz	330 nF to 1.1 µF	2.5 mF/F + 1 nF	
50 Hz to 1 kHz	(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	
(50 to 400) Hz	(11 to 33) µF	4 mF/F + 30 nF	
(50 to 200) Hz	(33 to 110) µF	5 mF/F + 100 nF	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source [1] (50 to 100) Hz	(110 to 330) µF	7 mF/F + 300 nF	Fluke 5500A
(50 to 100) Hz	330 µF to 1.1 mF	10 mF/F + 300 nF	
Electrical Simulation of Thermocouple Indicators [1] Type B	(600 to 800) °C	0.44 °C	Fluke 5500A
	(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	
	9150 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	Fluke 5500A

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicators [1] Type K	(-100 to -25) °C (-25 to 120) °C	0.18 °C 0.16 °C	Fluke 5500A
	(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	0.40 °C	
Type S	(0 to 250) °C (250 to 1 000) °C	0.47 °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	
Electrical Simulation of RTDs [1] Pt 395, 100 Ω	(-200 to -80) °C	0.05 °C	Fluke 5500A

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTDs [1]	(-80 to 0) °C	0.05 °C	Fluke 5500A
	(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 3926, 100 Ω	(-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	
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	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	
Pt 385, 200 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	0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTDs [1] Pt 385, 500 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	0.04 °C 0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.08 °C 0.09 °C 0.11 °C	Fluke 5500A
Pt 385, 1 kΩ	(-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	0.03 °C 0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.23 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.08 °C 0.08 °C 0.14 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C	
Amplitude – DC 50 Ω	(0 to 2.2) V	0.25 % + 100 µV	Fluke 5500A
1 MΩ	(0 to 33) V	0.25 % + 100 µV	
Amplitude – Square Wave 50 Ω	1.8 mV to 2.2 V	0.25 % + 100 µV	
1 MΩ	1.8 mV to 105 V	0.25 % + 100 µV	
Leveled Sine Wave (ref 50 kHz)	50 kHz reference	2 % + 200 µV	Fluke 5500A - SC300
Amplitude	50 kHz to 100 MHz	3.5 % + 300 µV	
	(100 to 300) MHz	4 % + 300 µV	
Flatness	50 kHz to 100 MHz (100 to 300) MHz	1.5 % + 100 µV 2 % + 100 µV	
Time Marker	5 s to 100 µs	(25 + 1 000*t*) µs/s	
	50 ms to 2 µs	(25 + 15 000*t*) µs/s	
	1 µs to 2 ns	25 µs/s	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rise Time	≤ 300 ps	+0/-100 ps	Fluke 5500A - SC300
Flatness	100 kHz to 1.04 GHz	0.05 dB	HP 8657A
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 °	Fluke 5500A - SC300
Frequency – Source [1]	0.01 Hz to 1.2 kHz	25 µHz/Hz + 1 mHz	Fluke 5500A - SC300
	(1.2 to 10) kHz	25 µHz/Hz + 1 mHz	
	10 kHz to 2 MHz	25 µHz/Hz + 15 mHz	
Insulation Tester [1] DC and AC @ 60 Hz	Up to 40 kV and 1 000A	1.1 % of reading	Fluke 45 with HV Probe and Decade Resistors
Power Supplies, Hypot Testers, Welders DC and AC @ 60 Hz [1]	Up to 40 kV and 1 000A	1 % of reading	Fluke 45 or HP 34401 With Shunts and Decade Resistors
Conductivity [1]	All	1 % of reading	Conductivity Standards
ESD Mats and Tables [1]	All	±25% of Ω Reading	OHM-STAT RT 1000

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Surface Plates [1]	Up to 144 in x 144 in Flatness Repeat	(11.3 + 0.3*D*) µin 12 µin	Autocollimator Repeat-o-meter
Bench Micrometers [1]	Up to 72 in	(9.4 + 5.2*L*) µin	Grade 1 Gage Blocks Optical Parallels Laser
Linear Measuring Machines [1]	Up to 72 in	(9.4 + 5.2*L*) µin	Grade 1 Gage Blocks Optical Parallels Laser
Optical Comparators Profile Projectors [1]	(5 to 60) in Screen X & Y Travel to 12 in	(75.3 + 2.2*L*) µin	Glass Scales Magnification Scales Magnification Pins Precision Balls
Indicators [1]	Up to 6 in	(12 + 1.0R) µin	Calibration Tester MAC-10 Calibrator Grade 2 Gage Blocks Surface Plate

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Calipers [1]	Up to 80 in	(124.6 + 24*L*) µin	Grade 2 Gage Blocks Ring Gages Surface Plate
Micrometers [1] O.D.& I.D Includes Depth, Point, Ball Blade, V,Pitch Anvals Bore (Intramic) Mic Heads	(1 to 60) in Up to 6 in Up to 2 in	(32.4 + 9.5*L*) µin 68 µin 61 µin	Grade 2 Gage Blocks Ring Gages Surface Plate Optical Parallels Ball Gages Ring Gages Heidenhein MT25
Cylindrical Squares Steel Blade Magnetic Combination	(2 to 12) in	108 µin	Surface Plate Test Indicator Angle Plate Cylindrical Square
Levels Digital Protractors Inclinometers	Up to 360 °	0.33 arc sec	Grade 2 Gage Blocks Surface Plate Sine Bar Autocollimator Angle Blocks
Optical Flats and Optical Parallels Flatness Parallelism	(1 to 6) in Up to 1 in	2.2 µin 3.6 µin	6" Master Flat Optical Vernier Gage Block Comparator
Height Gages Analog [1] Digital [1]	Up to 60 in	290 µin (10.1+7*L*) µin	Grade 2 Gage Blocks Surface Plate
Height Master [1] Riser Blocks Block Stacks	Up to 60 in 10 in and 12 in Up to 48 in	(10.1+7*L*) µin 21 µin (27.6 + 4.3*L*) µin	Grade 2 Gage Blocks Surface Plate Electronic Amplifier with Probe
Electronic Gage Dimensional Comparator [1]	Up to 6 in	7.8 µin	Grade 2 Gage Blocks Surface Plate
Toolmaker's Microscope Video Scope [1]	Up to 12 in Travel X, Y, and Z	(19 + 4.3*L*) µin	Glass Scales Laser
Glass Scales Stage micrometers Steel Rules	(0.001 to 12) in	(15.6 + 2.7*L*) µin	Mahr Measurement Machine /CCT Microscope
Autocollimator	Up to 60 arc min	0.21 arc sec	Autocollimator Calibrator Optical Wedge

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Rotary Table Dividing Heads Ultradex [1] Rotary Tilt	(0 to 360) ° (0 to 90) °	0.5 arc sec 1 arc sec	Autocollimator 12-Sided Polygon (30 degree)
Coordinate Measuring Machines [1]	12 to 72 in	(32.2 + 8.4*L*) µin	Granite Square Grade 2 Gage Blocks Ball Bar
Thread Wires	Up to 1 in	7.6 µin	Light Wave Micrometer Microkator Master Wires
Ring Gages	(0.125 to 12) in	(15.9 + 2.9*L*) µin	I.D. Comparator Mahr Measuring Machine
Plug Gages	(0.005 to 8) in	(8.9 + 1.8*L*) 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	Up to 360 °	0.30 arc sec	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
Thread Ring Setting Master	Up to 10 in	12 µin	Bench Micrometer Mahr Measurement Machine, Wires Grade 2 Gage Blocks
Calibration Testers	Up to 0.2 in	14 µin	Laser Grade 2 Gage Blocks Heidenhein MT25
Indicator Calibrators	Up to 2 in	14 µin	Laser Grade 2 Gage Blocks Heidenhein MT50
Gage Blocks	(0.01 to 0.1) in (0.1001 to 4) in (5 to 20) in	(2.7 + 3.8*L*) µin (2.0 + 3.1*L*) µin (1.8 + 1.7*L*) µin	Laser Comparator Grades 1 and 2 Gage Blocks Optical Flat

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) [2]	Reference Standard, Method, and/or Equipment
Crimp Tools	All	43µin	Pin Gages Point Micrometer
Repeat Reading Gages	All	15 µin	Grade 2 Gage Blocks Surface Plate
Sunnen Gage Setting Fixtures [1]	Up to 4 in	58 µin	Grade 2 Gage Blocks Optical Parallels
Sunnen Gages [1]	(0.375 to 4) in	45 µin	Ring Gages
Squares Granite & Ceramic	(2 to 24) in	(17.3 + 1.9*L*) µin	Autocollimator Parallel Mirror Surface Plate Optical Square
Straight Edges Granite & Ceramic	(6 to 60) in	(14.2 + 2.3*L*) µin	Autocollimator Parallel Mirror Surface Plate
Parallels Granite & Ceramic	(6 to 60) in	(14.2 + 2.3*L*) µin	Surface Plate Electronic Amplifier with Probe
Penta Prism Optical Square	90 °	0.37 arc sec	Autocollimator Parallel Mirror Surface Plate
Surface Roughness Gages [1] Specimens	(10 to 120) µin (10 to 120) µin	5.9 µin 3.1 µin	Calibrated Specimens Hommel Surface Tester

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	HRA Low Middle High	1.14 HRA 1.10 HRA 1.08 HRA	Indirect verification
	HRBw Low Middle High	1.49 HRBw 1.26 HRBw 1.18 HRBw	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rockwell Hardness Testers [1]	HRC Low Middle High	 1.14 HRC 1.29 HRC 1.18 HRC	Indirect verification
	HRE Low Middle High	 1.22 HRE 1.20 HRE 1.20 HRE	
	HRHw Low High	 1.15 HRHw 1.15 HRHw	
	HR15N Low Middle High	 1.16 HR15N 1.09 HR15N 1.09 HR15N	
	HR30N Low Middle High	 1.18 HR30N 1.16 HR30N 1.30 HR30N	
	HR45N Low Middle High	 1.17 HR45N 1.29 HR45N 1.08 HR45N	
	HR15Tw Low Middle High	 1.20 HR15Tw 1.13 HR15Tw 1.12 HR15Tw	
	HR30Tw Low Middle High	 1.23 HR30Tw 1.13 HR30Tw 1.11 HR30Tw	
	HR45Tw Low Middle High	 1.23 HR45Tw 1.27 HR45Tw 1.14 HR45Tw	
Micro Hardness Testers [1]	Vickers 100 gf 500 gf 1 000 gf	 28.3 HV 12.9 HV 6.7 HV	Indirect verification

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micro Hardness Testers [1]	Knoop 100 gf 500 gf 1 000 gf	37.5 HK 19.4 HK 10 HK	Indirect verification
Micro Hardness Testers[1]	10 to 1 000 g	2 % of reading	Direct Verification
Rockwell Hardness Testers[1]	3 to 150 kg	0.2 % of reading	Direct Verification
Durometer and Shore Hardness Tester [1] Force Only	Types A, D, M	0.72 point	Gage Blocks Digital Force Gage Fixture
Force Gages [1] Load Cells	Up to 100 g 100 to 500 g 500 g to 5 kg (5 to 25) kg Up to 500 lb (500 to 10 000) lb	2.9 mg 2.9 mg 16 mg 240 mg 1.7 g 0.2 % of reading	Class F Weights Load Cells
Scales and Balances [1]	Up to 100 g 100 to 500 g 500 g to 5 kg (5 to 25) kg Up to 500 lb	2.9 mg 2.9 mg 16 mg 240 mg 1.7 g	Class F Weights OIML M1
Mass	Up to 100 g 100 to 1 000 g 1 kg to 2 kg 2 kg to 5 kg 5 kg to 10 kg 10 kg to 20 kg	1.3 mg 2.6 mg 3.6 mg 17 mg 120 mg 120 mg	Class F Weights OIML M1
Torque Tools [1]	0.1 ozf·in to 1 200 lbf·ft	1% of reading	Waters Torque Watch Calibrator Digital Torque Calibrator Load Cells
Torque Calibrators Torque Ratio Arms & Wheels	0.1 ozf·in to 1 200 lbf·ft (1 to 60) in	0.5% of reading $(22.7 + 9.8L)$ µin	Torque Arms Class F Weights Surface Plate, Gage Blocks, Amp & Probe
Pressure and Vacuum Gages [1]	Up to -25 inHg Up to 500 psi Up to 10 000 psi	0.03 % of reading 0.03 % of reading 0.11 % of reading	Fluke Master Gages Omega DRO/ Transducer

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Ovens Environmental Chambers Freezers Temperature Bath [1]	(0 to 2 501) °F (5 to 95) %RH (0 to 100) °C	2.9 °F 4 % RH 0.22 °C	Data Logger Thermocouple Calibrator Digital Psychrometer Lab Thermometer
Temperature Controllers Thermometers IR Thermometers	(32 to 752) °F (0 to 400) °C Ambient to 1 000°F Ambient to 538°C	0.43 °F 0.24 °C 1.3 °F 0.73 °C	Lab Oven Thermocouple Calibrator Hart Fluke 1502A Omega Ice point (Dry Block)
Thermocouples	Ambient to 1 000°F Ambient to 538°C	1.3 °F 0.73 °C	Lab Oven Thermocouple Calibrator Hart Fluke 1502A Temperature Bath Fluke 5500
Hygrometers Hygrothermographs Humidity Gages	11.3 %RH@25°C 32.8 %RH@25°C 75.3 %RH@25°C 97.3 %RH@25°C	2 % of reading 2 % of reading 2 % of reading 3 % of reading	Environmental Chamber and Salt Solutions

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches & Timers [1] Analog and Digital Stopwatches Timers	Up to 48 hr	0.86 sec/day 5.2 sec/day	Quartz Standard Stop Watch
Tachometers Photo Type Mechanical Type	Up to 100 000 RPM (10 to 1 000) RPM (1 001 to 6 000) RPM	0.0035 % of reading 0.05% Reading +2 RPM 0.05% Reading +1 RPM	HP34401A, Wavetek 171 Signal Generator, 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. The use of L = Length in inches, D = Diagonal length in inches.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1376.

Vice President