



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

**Garber Metrology Weighing Solutions &
Precision Calibration**

**520 E. Oregon Road
Lititz, PA 17543**

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

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.

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: 26 January 2023

Certificate Number: AC-1255



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)**

Garber Metrology Weighing Solutions & Precision Calibration

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CALIBRATION

Valid to: **January 26, 2023**

Certificate Number: **AC-1255**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ¹	Up to 329.999 9 mV (0.33 to 3.299 99) V (3.3 to 32.999 99) V (30 to 329.999 9) V (100 to 1 020) V	15 μ V/V + 1 μ V 8.5 mV/V + 2 μ V 9.3 mV/V + 20 μ V 0.14 V/V + 0.15 mV 0.14 V/V + 1.5 mV	Fluke 5522A Multiproduct Calibrator
DC Voltage - Measure	(0 to 100) mV 100 mV to 1) V (1 to 10) V (10 to 100) V (100 to 1 000) V	14 μ V/V 9.4 μ V/V 9.1 μ V/V 12 μ V/V 12 μ V/V	HP 3458A 8.5 Digit Multimeter
DC High Voltage – Measure	(1 to 5) kV	0.05 % of reading	Vitrek 4700 High Voltage Meter
DC Current – Source ¹	(0 to 329.999 9) μ A (0 to 3.299 99) mA (0 to 32.999 9) mA (0 to 329.999) mA (0 to 1.099 99) A (1.1 to 2.999 9) A (0 to 10.999 9) A (11 to 20.5) A	0.12 μ A/A + 20 nA 80 nA/A + 50 nA 80 nA/A + 0.3 μ A 80 nA/A + 2.5 μ A 0.2 μ A/A + 40 μ A 0.3 μ A/A + 40 μ A 0.4 μ A/A + 0.5 mA 0.8 μ A/A + 0.8 mA	Fluke 5522A Multiproduct Calibrator
DC Current Measure	Up to 100 nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 10) mA	500 μ A/A 69 μ A/A 34 μ A/A 32 μ A/A 28 μ A/A	HP 3458A 8.5 Digit Multimeter



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current Measure	(10 to 100) mA (0.1 to 1) A	45 μ A/A 140 μ A/A	HP 3458A 8.5 Digit Multimeter
Resistance – Source ¹	Up to 10.999 9 Ω (11 to 32.999 9) Ω 33 Ω to 109 k Ω (0.11 to 1.099 99) M Ω (1.1 to 3.299 9) M Ω (3.3 to 10.999 9) M Ω (11 to 32.999 9) M Ω (33 to 109.999 9) M Ω (110 to 329.999 9) M Ω (330 to 1 100) M Ω	30 $\mu\Omega/\Omega$ 24 $\mu\Omega/\Omega$ 22 $\mu\Omega/\Omega$ 25 $\mu\Omega/\Omega$ 47 $\mu\Omega/\Omega$ 0.1 m Ω/Ω 0.2 m Ω/Ω 0.4 m Ω/Ω 2.3 m Ω/Ω 12 m Ω/Ω	Fluke 5522A Multiproduct Calibrator
Resistance - Measure	(1 to 10) Ω (10 to 100) Ω (0.1 to 1) k Ω (1 to 10) k Ω (10 to 100) k Ω (0.1 to 1) M Ω (1 to 10) M Ω (10 to 100) M Ω (0.1 to 1) G Ω	23 $\mu\Omega/\Omega$ 19 $\mu\Omega/\Omega$ 12 $\mu\Omega/\Omega$ 12 $\mu\Omega/\Omega$ 12 $\mu\Omega/\Omega$ 20 $\mu\Omega/\Omega$ 70 $\mu\Omega/\Omega$ 5.8 m Ω/Ω 300 m Ω/Ω	HP 3458A 8.5 Digit Multimeter
Capacitance – Source ¹	(220 to 399.9) pF (0.4 to 1.099 9) nF (1.1 to 3.299 9) nF (3.3 to 10.999 9) nF (11 to 32.999 9) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.099 99) μ F (1.1 to 3.299 99) μ F (3.3 to 10.999 9) μ F (11 to 32.999 9) μ F (33 to 109.999) μ F (110 to 329.999) μ F (0.33 to 1.099 99) mF (1.1 to 3.299 99) mF (3.3 to 10.999 9) mF (11 to 32.999 9) mF (33 to 110) mF	1.5 pF/F + 10 pF 4 pF/F + 10 pF 13 pF/F + 10 pF 21 pF/F + 1 pF 64 pF/F + 0.1 nF 0.2 nF/F + 0.1 nF 0.7 nF/F + 0.3 nF 2 nF/F + 1 nF 6 nF/F + 3 nF 21 nF/F + 10 nF 0.1 μ F/F + 30 nF 0.4 μ F/F + 0.1 μ F 1.1 μ F/F + 0.3 μ F 4 μ F/F + 1 μ F 12 μ F/F + 3 μ F 38 μ F/F + 10 μ F 0.2 mF/F + 30 μ F 0.9 mF/F + 0.1 mF	Fluke 5522A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	(1 to 32.999) mV		Fluke 5522A Multiproduct Calibrator
	(10 to 45) Hz	0.6 mV/V + 6 μV	
	45 Hz to 10 kHz	0.1 mV/V + 6 μV	
	(10 to 20) kHz	0.2 mV/V + 6 μV	
	(20 to 50) kHz	0.8 mV/V + 6 μV	
	(50 to 100) kHz	2.7 mV/V + 12 μV	
	(100 to 500) kHz	6.2 mV/V + 50 μV	
	(33 to 329.999) mV		
	(10 to 45) Hz	0.2 mV/V + 8 μV	
	45 Hz to 10 kHz	0.1 mV/V + 8 μV	
	(10 to 20) kHz	0.1 mV/V + 8 μV	
	(20 to 50) kHz	0.3 mV/V + 8 μV	
	(50 to 100) kHz	0.6 mV/V + 32 μV	
	(100 to 500) kHz	1.5 mV/V + 70 μV	
	(0.33 to 3.299 99 V)		
	(10 to 45) Hz	0.2 mV/V + 50 μV	
	45 Hz to 10 kHz	0.1 mV/V + 60 μV	
	(10 to 20) kHz	0.1 mV/V + 60 μV	
	(20 to 50) kHz	0.2 mV/V + 50 μV	
	(50 to 100) kHz	0.5 mV/V + 0.1 mV	
	(100 to 500) kHz	1.9 mV/V + 0.6 mV	
	(3.3 V to 32.999 9) V		
	(10 Hz to 45) Hz	0.2 mV/V + 0.7 mV	
	45 Hz to 10 kHz	0.1 mV/V + 0.6 mV	
	(10 to 20) kHz	0.2 mV/V + 0.6 mV	
	(20 to 50) kHz	0.3 mV/V + 0.6 mV	
	(50 to 100) kHz	0.7 mV/V + 1.6 mV	
(33 to 329.999) V			
(10 Hz to 45) Hz	0.2 mV/V + 2 mV		
45 Hz to 10 kHz	0.2 mV/V + 6 mV		
(10 to 20) kHz	0.2 mV/V + 6 mV		
(20 to 50) kHz	0.2 mV/V + 6 mV		
(50 to 100) kHz	1.6 mV/V + 50 mV		
(330 to 1 020) V			
45 Hz to 1 kHz	0.2 mV/V + 10 mV		
(1 to 5) kHz	0.2 mV/V + 10 mV		
(5 to 10) kHz	0.2 mV/V + 10 mV		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure	Up to 10 mV		HP 3458A 8.5 Digit Multimeter
	(1 to 40) Hz	0.3 mV/V + 3 μV	
	40 Hz to 1 kHz	0.2 mV/V + 2 μV	
	(1 to 20) kHz	0.3 mV/V + 2 μV	
	(20 to 50) kHz	1.2 mV/V + 2 μV	
	(50 to 100) kHz	5.8 mV/V + 2 μV	
	(100 to 300) kHz	46 mV/V + 2 μV	
	10mV to 10 V		
	(1 to 40) Hz	80 μV/V + 0.4 mV	
	40 Hz to 1 kHz	80 μV/V + 0.2 mV	
	(1 to 20) kHz	0.2 mV/V + 0.2 mV	
	(20 to 50) kHz	0.3 mV/V + 0.2 mV	
	(50 to 100) kHz	0.9 mV/V + 0.2 mV	
	(100 to 300) kHz	3.5 mV/V + 1 mV	
	300 kHz to 1 MHz	12 mV/V + 1 mV	
	(1 to 2) MHz	17 mV/V + 1 mV	
	(10 to 100) V		
	(1 to 40) Hz	0.2 mV/V + 4 mV	
	40 Hz to 1 kHz	0.2 mV/V + 2 mV	
	(20 to 50) kHz	0.4 mV/V + 2 mV	
(50 to 100) kHz	1.4 mV/V + 2 mV		
(100 to 300) kHz	4.6 mV/V + 10 mV		
300 kHz to 1 MHz	17 mV/V + 10 mV		
100 V to 1 kV			
(1 to 40) Hz	0.5 mV/V + 40 mV		
40 Hz to 1 kHz	0.5 mV/V + 20 mV		
(1 to 20) kHz	0.7 mV/V + 20 mV		
(20 to 50) kHz	1.4 mV/V + 20 mV		
(50 to 100) kHz	3.5 mV/V + 20 mV		
AC High Voltage – Measure	(50 to 60) Hz (1 to 5) kV	0.15 % of reading	Vitrek 4700 High Voltage Meter
AC Current – Source ¹	(29 to 329.99) 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	0.5 μA/A + 0.1 μA 0.4 μA/A + 0.1 μA 0.3 μA/A + 0.1 μA 0.8 μA/A + 0.2 μA 2. μA/A + 0.2 μA 4.1 μA/A + 0.4 μA	Fluke 5522A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(0.33 to 3.299 9) mA		Fluke 5522A Multiproduct Calibrator
	(10 to 20) Hz	5.1 μ A/A + 0.2 μ A	
	(20 to 45) Hz	3.2 μ A/A + 0.2 μ A	
	45 Hz to 1 kHz	2.6 μ A/A + 0.2 μ A	
	(1 to 5) kHz	5.1 μ A/A + 0.2 μ A	
	(5 to 10) kHz	12.8 μ A/A + 0.3 μ A	
	(10 to 30) kHz	25.6 μ A/A + 0.6 μ A	
	(3.3 to 32.999) mA		
	(10 to 20) Hz	46.1 μ A/A + 2 μ A	
	(20 to 45) Hz	23 μ A/A + 2 μ A	
	45 Hz to 1 kHz	10.2 μ A/A + 2 μ A	
	(1 to 5) kHz	20.5 μ A/A + 2 μ A	
	(5 to 10) kHz	51.2 μ A/A + 3 μ A	
	(10 to 30) kHz	0.1 mA/A + 4 μ A	
	(33 to 329.999) mA		
	(10 to 20) Hz	0.5 mA/A + 20 μ A	
	(20 to 45) Hz	0.2 mA/A + 20 μ A	
	45 Hz to 1 kHz	0.1 mA/A + 20 μ A	
	(1 to 5) kHz	0.3 mA/A + 50 μ A	
	(5 to 10) kHz	0.5 mA/A + 0.1 mA	
	(10 to 30) kHz	1 mA/A + 0.2 mA	
	(0.33 to 1.099 9) A		
	(10 to 45) Hz	1.5 mA/A + 0.1 mA	
	45 Hz to 1 kHz	0.4 mA/A + 0.1 mA	
	(1 to 5) kHz	5.1 mA/A + 1 mA	
	(5 to 10) kHz	21.3 mA/A + 5 mA	
	(1.1 to 2.999) A		
	(10 to 45) Hz	4.2 mA/A + 0.1 mA	
45 Hz to 1 kHz	1.4 mA/A + 0.1 mA		
(1 to 5) kHz	14 mA/A + 1 mA		
(5 to 10) kHz	58 mA/A + 5 mA		
(3 to 10.999) A			
(45 to 100) Hz	5 mA/A + 2 mA		
100 Hz to 1 kHz	8.5 mA/A + 2 mA		
(1 to 5) kHz	0.3 A/A + 2 mA		
(11 to 20.5) A			
(45 to 100) Hz	19 mA/A + 5 mA		
100 Hz to 1 kHz	24 mA/A + 5 mA		
(1 to 5) kHz	0.5 A/A + 5 mA		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
AC Current - Measure	Up to 100 μ A		HP 3458A 8.5 Digit Multimeter	
	(10 to 20) Hz	4.9 mA/A + 30 nA		
	(20 to 45) Hz	2 mA/A + 30 nA		
	45 Hz to 5 kHz	1 mA/A + 30 nA		
	(0.1 to 100) mA			
	(10 to 20) Hz	4.6 mA/A + 20 μ A		
	(20 to 45) Hz	1.7 mA/A + 20 μ A		
	(45 to 100) Hz	0.7 mA/A + 20 μ A		
	100 Hz to 5 kHz	0.4 mA/A + 20 μ A		
	(0.1 to 1) A			
	(10 to 20) Hz	4.8 mA/A + 0.2 mA		
	(20 to 45) Hz	2 mA/A + 0.2 mA		
	(45 to 100) Hz	1.2 mA/A + 0.2 mA		
	100 Hz to 5 kHz	1.4 mA/A + 0.2 mA		
(5 to 20) kHz	3.7 mA/A + 0.2 mA			
(20 to 50) kHz	12 mA/A + 0.2 mA			
Oscilloscopes ¹ Amplitude – DC 50 Ω load	0 V	12 mV	Fluke 5500A/6 Multiproduct Calibrator with 600 MHz Scope Option	
	6 V	12 mV		
	1 M Ω load	0 V		12 mV
		66 V		43 mV
		130 V		76 mV
	Amplitude – Square wave into 50 Ω load	0.1 Vp-p		
		10 kHz		3.6 mV
		1 Vp-p		
		10 kHz		35 mV
	into 1 M Ω load	5 Vp-p		
		10 kHz		0.17 V
		0.1 Vp-p		
		10 kHz		2.2 mV
		1 Vp-p		
10 kHz		35 mV		
10 Vp-p				
10 kHz		0.35 V		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
Oscilloscopes ¹				
Leveled Sine Flatness (relative to 50 kHz) into 50 Ω load	10 mVp-p 50 kHz 30 mVp-p 100 kHz 300 MHz 600 MHz	0.3 mV 0.7 mV 0.83 mV 1.5 mV	Fluke 5500A/6 Multiproduct Calibrator with 600 MHz Scope Option	
Rise Time	5 V p-p 50 kHz 100 kHz 300 MHz 600 MHz	96 mV 96 mV 0.13 V 0.26 V		
1 MHz	1 Vp-p Up to 400 ps	8.1 ps		
10 MHz	0.5 Vp-p Up to 400 ps 1 Vp-p Up to 400 ps	8.2 ps 8.2 ps		
Time Markers	2 ns 20 ms 50 ms 5 s	20 ps 0.2 μs 0.5 μs 0.15 s		
Electrical Simulation of RTD Indicating Devices ¹	Cu 427, 10 Ω (-100 to 260) °C 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	0.23 °C 0.04 °C 0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C		Fluke 5522A 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 ¹	Pt 385, 200 Ω		Fluke 5522A Multiproduct Calibrator
	(-200 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.03 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.09 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 600) °C	0.11 °C	
	(600 to 630) °C	0.12 °C	
	Pt 385, 500 Ω		
	(-200 to -80) °C	0.03 °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	0.06 °C	
	(300 to 400) °C	0.06 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.09 °C	
	Pt 385, 1 000 Ω		
	(-200 to -80) °C	0.02 °C	
	(-80 to 0) °C	0.02 °C	
	(0 to 100) °C	0.03 °C	
	(100 to 260) °C	0.04 °C	
	(260 to 300) °C	0.05 °C	
(300 to 400) °C	0.05 °C		
(400 to 600) °C	0.05 °C		
(600 to 630) °C	0.18 °C		
Pt 3926, 100 Ω			
(-200 to -80) °C	0.04 °C		
(-80 to 0) °C	0.04 °C		
(0 to 100) °C	0.05 °C		
(100 to 300) °C	0.07 °C		
(300 to 400) °C	0.08 °C		
(400 to 630) °C	0.09 °C		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices ¹	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 PtNi 385, 120 Ω (-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.19 °C 0.03 °C 0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.18 °C 0.06 °C 0.06 °C 0.11 °C	Fluke 5522A Multiproduct Calibrator
Electrical Simulation of Thermocouple – Measure/Source ¹	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C Type C (0 to 150) °C (150 to 650) °C (650 to 1 000) °C (1 000 to 1 800) °C (1 800 to 2 316) °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 J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.34 °C 0.26 °C 0.23 °C 0.26 °C 0.23 °C 0.2 °C 0.24 °C 0.39 °C 0.65 °C 0.39 °C 0.12 °C 0.11 °C 0.12 °C 0.16 °C 0.21 °C 0.12 °C 0.11 °C 0.13 °C 0.18 °C	Fluke 5522A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple – Measure/Source ¹	Type K		Fluke 5522A Multiproduct Calibrator
	(-200 to -100) °C	0.26 °C	
	(-100 to -25) °C	0.14 °C	
	(-25 to 120) °C	0.12 °C	
	(120 to 1 000) °C	0.2 °C	
	(1 000 to 1 372) °C	0.31 °C	
	Type L		
	(-200 to -100) °C	0.29 °C	
	(-100 to 800) °C	0.2 °C	
	(800 to 900) °C	0.13 °C	
	Type N		
	(-200 to -100) °C	0.31 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 120) °C	0.15 °C	
	(120 to 410) °C	0.14 °C	
	(410 to 1 300) °C	0.21 °C	
	Type R		
	(0 to 250) °C	0.44 °C	
	(250 to 400) °C	0.27 °C	
	(400 to 1 000) °C	0.26 °C	
(1 000 to 1 767) °C	0.31 °C		
Type S			
(0 to 250) °C	0.36 °C		
(250 to 1 000) °C	0.28 °C		
(1 000 to 1 400) °C	0.29 °C		
(1 400 to 1 767) °C	0.36 °C		
Type T			
(-250 to -150) °C	0.49 °C		
(-150 to 0) °C	0.19 °C		
(0 to 120) °C	0.12 °C		
(120 to 400) °C	0.11 °C		
Type U			
(-200 to 0) °C	0.43 °C		
(0 to 600) °C	0.21 °C		
DC Power ¹	Up to 10 W	0.3 mW	Fluke 5500A Multiproduct Calibrator
	(20 to 50) W	2 mW	
	100 W	3 mW	
	(200 to 900) W	20 mW	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power ¹	60 Hz		Fluke 5500A Multiproduct Calibrator
	(5 to 50) W	5 mW	
	100 W	19 mW	
	200 W	20 mW	
	390 W	26 mW	
	550 W	20 mW	
	900 W	21 mW	
	400 Hz		
	100 W	3 mW	
	1 kHz		
100 W	3 mW		
5 kHz			
100 W	16 mW		

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks	Up to 1 in (1 to 4) in (4 to 10) in (10 to 13) in	3.7 μm 5.1 μm 7.8 μm 7.8 μm	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks
Thread Measuring Wires (4 to 120) tpi	(0.004 81 to 0.144 352) in	8.8 μm	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks
Plain Plugs/Pin Gages	(0.004 to 1) in (1 to 4) in (4 to 12) in	6.8 μm 9.7 μm 19 μm	
Pins	Up to 1 in	30 μm	
Thread Plugs	Up to 1 in (1 to 3) in (3 to 7.5) in	14 μm 35 μm 61 μm	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks, Thread Measuring Wires
NPT Thread Plugs	Up to 1 in (1 to 3) in (3 to 6) in	16 μm 18 μm 29 μm	
Thread Rings	Up to 1 in (1 to 4) in (4 to 8) in	20 μm 35 μm 59 μm	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Plain Rings	(0.04 to 1) in (1 to 4) in (4 to 12) in	18 µin 21 µin 30 µin	
Micrometers ¹ (OD, ID, Bore, Depth)	Up to 1 in (1 to 10) in (10 to 48) in	84 µin 140 µin 170 µin	Grade 2 Gage Blocks, Optical Flat
Calipers ¹ (Dial, Vernier, & Digital)	Up to 6 in (6 to 12) in (12 to 48) in (48 to 120) in	580 µin 580 µin 585 µin 610 µin	
Indicator Calibrators	Up to 1 in	59 µin	
Height Gages ¹	Up to 12 in (12 to 48) in	600 µin 615 µin	
Indicators ¹ Dial and Digital Resolution: 0.001 in 0.000 1 in 0.000 05 in 0.000 02 in 0.000 01 in	Up to 6 in Up to 0.5 in Up to 0.05 in Up to 0.02 in Up to 0.01 in	290 µin 140 µin 58 µin 34 µin 14 µin	Grade 2 Gage Blocks, Indicator Calibrator
Surface Plates ¹ Overall Flatness	Up to (36 x 48) in Up to (72 x 144) in	240 µin 240 µin	Planeators, Straight Indicators
Local Area Flatness (Repeat Reading)	Up to (36 x 48) in Up to (72 x 144) in	55 µin 55 µin	
Length Standards	Up to 1 in (1 to 4) in (4 to 10) in	7 µin 11 µin 19 µin	Pratt & Whitney LMU- 2130 Comparator, Grade 1 Gage Blocks, Electronic Height Gage
Parallels	Up to 4 in	10 µin	Pratt & Whitney LMU- 2130 Comparator, Grade 1 Gage Blocks
Optical Comparators X, Y Axis Length	Up to 6 in	900 µin	Glass Scale Standard, Check Balls

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure / Vacuum Devices	(0 to 300) psig	0.1 psi	Druck DPI610 Precision Pressure Calibrator
	Up to 30 inHg Up to 100 psi (100 to 150) psi (150 to 1 000) psi (1 000 to 10 000) psi	0.1 inHg 0.1 psi 1 psi 2.2 psi 3.1 psi	Druck DPI610 Precision Pressure Calibrator, Ametek R-110-1 Dead Weight Tester
Torque Tools	(4 to 100) ozf·in (5 to 250) lbf·ft (250 to 600) lbf·ft	0.32 % of reading + 0.01 ozf·in 0.32 % of reading + 0.01 lbf·ft 1.3 % of reading + 0.01 lbf·ft	CDI Sure-test 5000-ST Torque Calibrator
Torque Calibrator	(4 to 50) lbf·in (30 to 400) lbf·in (100 to 1 000) lbf·in (20 to 250) lbf·ft	0.01 lbf·in 0.03 lbf·in 0.13 lbf·in 0.04 lbf·ft	Torque Arms & Class F Weights
Durometers Spring Force Types A, B, E, O Types C, D, DO	Up to 100 units or (0 to 8.05) N [lbf, kgf] (0 to 44.45) N [lbf, gf]	0.02 lbf, 0.009 9 kgf 0.12 lbf, 54 gf	Triple Beam Balance
Pipettes	(2 to 20) µL (20 to 100) µL (100 to 1 250) µL (2 000 to 9 000) µL (9 000 to 10 000) µL	0.2 µL 0.2 µL 1.3 µL 5 µL 7 µL	Balance, Class 1 Weights
Class F Masses	(1 to 2) g (5 to 100) g 200 g 500 g 1 000 g (2 000 to 5 000) g (0.001 to 0.002) lb (0.005 to 0.2) lb (0.5 to 10) lb (10 to 50) lb	0.3 mg 0.4 mg 13 mg 22 mg 33 mg 56 mg 0.000 000 5 lb 0.000 014 lb 0.000 3 lb 0.001 6 lb	Balance, ASTM E617 Class 3 Weights per NIST HB 105-1
Balances and Scales ¹ 0.1 mg resolution	Up to 10 g Up to 200 g	0.2 mg 0.3 mg	ASTM E617 Class 0 Weights per NIST Handbook 44
	(200 to 600) g (600 to 6 000) g	15 mg 22 mg	ASTM E617 Class 1 Weights per NIST Handbook 44

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales ¹ 0.1 g resolution	Up to 1.2 kg (1.2 to 2) kg (2 to 6) kg (5 to 30) kg	0.1 g 0.1 g 0.2 g 0.2 g	NIST Class F Weights per NIST Handbook 44
Balances and Scales ¹ Resolution: 0.000 2 lb 0.000 5 lb 0.001 lb 0.005 lb 0.002 lb 0.005 lb 0.01 lb 0.05 lb 0.05 lb 0.2 lb 0.5 lb 1 lb 2 lb 20 lb	Up to 2 lb Up to 5 lb Up to 10 lb Up to 20 lb Up to 25 lb Up to 50 lb Up to 100 lb Up to 150 lb Up to 500 lb Up to 1 000 lb Up to 3 000 lb Up to 5 000 lb Up to 20 000 lb Up to 200 000 lb	0.000 4 lb 0.001 lb 0.002 lb 0.01 lb 0.004 lb 0.01 lb 0.03 lb 0.1 lb 0.1 lb 0.3 lb 0.6 lb 1.3 lb 2.6 lb 27 lb	NIST Class F Weights per NIST Handbook 44

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Source	(-5 to 140) °C	0.24 °C	Hart Scientific 9105 Drywell
	(0 to 260) °C	0.69 °C	Hart 6102 Micro-bath
Micro-bath and Drywell Calibrators	(-200 to 660) °C	0.35 °C	HP 3458A 8.5 Digit Multimeter and RTD Probe
RTD and Thermocouple Probes (4 wires measure)	-180 °C	0.05 °C	HP 3458A 8.5 Digit Multimeter, RTD Probe Hart 9105 Drywell Calibrator, Hart 9173 Drywell Calibrator, Hart 6102 Micro-bath
	100 °C	0.05 °C	
	780 °C	0.05 °C	
RTD and Thermocouple Probes (3 wires measure)	-180 °C	0.07 °C	HP 3458A 8.5 Digit Multimeter, RTD Probe Hart 9105 Drywell Calibrator, Hart 9173 Drywell Calibrator, Hart 6102 Micro-bath
	100 °C	0.06 °C	
	780 °C	0.15 °C	
RTD and Thermocouple Probes (Source)	-180 °C	0.12 °C	HP 3458A 8.5 Digit Multimeter, RTD Probe Hart 9105 Drywell Calibrator, Hart 9173 Drywell Calibrator, Hart 6102 Micro-bath
	100 °C	0.12 °C	
	780 °C	0.12 °C	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermo-hygrometers Temperature Humidity	(0 to 180) °C (30 to 90) %RH	0.5 % of reading + 0.15 °C 0.5 % of reading + 0.9 %RH	Comparison to Vaisala MI70/HMP75 Temp/Humidity Indicator with Probe

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Source/Measure	Up to 100 Hz (1 to 10) kHz 100 kHz (1 to 10) MHz 20 MHz to 1 GHz	19 nHz 16 nHz 24 nHz 17 nHz 30 Hz	MS-1009B Rubidium Oscillator & Marconi 2022A Signal Generator

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. D = diagonal length in inches.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1255.



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