



# 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](http://www.anab.org).

A handwritten signature in black ink, appearing to be 'J. Stine', is positioned above a horizontal line.

Jason Stine, Vice President

Expiry Date: 26 January 2025  
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, 2025**

Certificate Number: **AC-1255**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source <sup>1</sup>	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1 100) V	7.5 $\mu$ V/V + 0.4 $\mu$ V 5 $\mu$ V/V + 0.7 $\mu$ V 3.5 $\mu$ V/V + 2.5 $\mu$ V 3.5 $\mu$ V/V + 4 $\mu$ V 5 $\mu$ V/V + 40 $\mu$ V 6.5 $\mu$ V/V + 0.4 mV	Fluke 5730A Multiproduct Calibrator
DC Voltage – Measure <sup>1</sup>	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	7.5 $\mu$ V/V + 0.2 $\mu$ V 2.9 $\mu$ V/V + 0.3 $\mu$ V 2.9 $\mu$ V/V + 0.5 $\mu$ V 4.3 $\mu$ V /V + 30 nV 4.4 $\mu$ V/V + 0.5 mV	Fluke 8588A 8.5 Digit Multimeter
DC High Voltage – Measure <sup>1</sup>	(1 to 10) kV (10 to 40) kV	0.04 % of reading 0.39 % of reading + 10 V	Vitrek 4700 High Voltage Meter, Fluke 5322A Safety Tester w/ High Voltage Probe
DC Current – Source <sup>1</sup>	Up to 220 $\mu$ A 220 $\mu$ A to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	40 $\mu$ A/A + 6 nA 35 $\mu$ A/A + 7 nA 35 $\mu$ A/A + 40 nA 45 $\mu$ A/A + 0.7 $\mu$ A 80 $\mu$ A/A + 12 $\mu$ A	Fluke 5730A Multiproduct Calibrator
DC Current – Source <sup>1</sup>	(2.2 to 2.999 9) A (0 to 10.999 9) A (11 to 20.5) A	0.3 mA/A + 40 $\mu$ A 0.4 mA/A + 0.5 mA 0.8 mA/A + 0.75 mA	Fluke 5522A Multiproduct Calibrator



ANSI National Accreditation Board

Electrical – DC/Low Frequency

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DC Current – Measure <sup>1</sup>	Up to 100 nA (0.1 to 1) $\mu$ A	0.5 mA/A 69 $\mu$ A/A	HP 3458A 8.5 Digit Multimeter
DC Current – Measure <sup>1</sup>	(1 to 10) $\mu$ A (10 to 100) $\mu$ A 100 $\mu$ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 10) A (10 to 30) A	27 $\mu$ A/A + 0.4 nA 9.8 $\mu$ A/A + 0.4 nA 9.2 $\mu$ A/A + 4 nA 14 $\mu$ A/A + 40 nA 57 $\mu$ A/A + 0.1 $\mu$ A 0.13 mA/A + 1 $\mu$ A 0.23 mA/A + 4 $\mu$ A 0.55 mA/A + 0.44 mA	Fluke 8588A 8.5 Digit Multimeter
DC Current – Source Clamp-on Meters <sup>1</sup>	(10 to 50) A (50 to 100) A (100 to 500) A	0.17 A 0.2 A 1.2 A	Transmille EA002 Coil Adapter, Fluke 5522A Multiproduct Calibrator
Resistance – Source <sup>1</sup> (Fixed Artifacts)	0 $\Omega$ 1 $\Omega$ 1.9 $\Omega$ 10 $\Omega$ 19 $\Omega$ 100 $\Omega$ 190 $\Omega$ 1 k $\Omega$ 1.9 k $\Omega$ 10 k $\Omega$ 19 k $\Omega$ 100 k $\Omega$ 190 k $\Omega$ 1 M $\Omega$ 1.9 M $\Omega$ 10 M $\Omega$ 19 M $\Omega$ 100 M $\Omega$	40 $\mu$ $\Omega$ 95 $\mu$ $\Omega$ 0.18 m $\Omega$ 0.23 m $\Omega$ 0.44 m $\Omega$ 1 m $\Omega$ 1.9 m $\Omega$ 6.5 m $\Omega$ 12.4 m $\Omega$ 65 m $\Omega$ 0.12 $\Omega$ 0.85 $\Omega$ 1.6 $\Omega$ 13 $\Omega$ 34 $\Omega$ 0.4 k $\Omega$ 0.9 k $\Omega$ 10 k $\Omega$	Fluke 5730A Multiproduct Calibrator
Resistance – Measure <sup>1</sup>	Up to 1 $\Omega$ (1 to 10) $\Omega$ (10 to 100) $\Omega$ 100 $\Omega$ to 1 k $\Omega$ (1 to 10) k $\Omega$ (10 to 100) k $\Omega$ 100 k $\Omega$ to 1 M $\Omega$ (1 to 10) M $\Omega$ (10 to 100) M $\Omega$ 100 M $\Omega$ to 1 G $\Omega$	17 $\mu$ $\Omega$ / $\Omega$ + 4 $\mu$ $\Omega$ 10.1 $\mu$ $\Omega$ / $\Omega$ + 14 $\mu$ $\Omega$ 9.2 $\mu$ $\Omega$ / $\Omega$ + 50 $\mu$ $\Omega$ 9.1 $\mu$ $\Omega$ / $\Omega$ + 0.5 m $\Omega$ 9.2 $\mu$ $\Omega$ / $\Omega$ + 5 m $\Omega$ 9.3 $\mu$ $\Omega$ / $\Omega$ + 50 m $\Omega$ 10.6 $\mu$ $\Omega$ / $\Omega$ + 1 $\Omega$ 19 $\mu$ $\Omega$ / $\Omega$ + 0.1 k $\Omega$ 0.12 m $\Omega$ / $\Omega$ + 10 k $\Omega$ 1.3 m $\Omega$ / $\Omega$ + 1 M $\Omega$	Fluke 8588A 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
Capacitance – Source <sup>1</sup> (Simulation)	(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) μF (1.1 to 3.299 99) μF (3.3 to 10.999 9) μF (11 to 32.999 9) μF (33 to 109.999) μF (110 to 329.999) μF (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	0.004 % of reading + 10 pF 0.004 % of reading + 10 pF 0.004 % of reading + 10 pF 0.002 % of reading + 0.3 nF 0.002 % of reading + 1 nF 0.002 % of reading + 3 nF 0.002 % of reading + 10 nF 0.003 % of reading + 30 nF 0.004 % of reading + 0.1 μF 0.004 % of reading + 0.3 μF 0.004 % of reading + 1 μF 0.004 % of reading + 3 μF 0.004 % of reading + 10 μF 0.006 % of reading + 30 μF 0.009 % of reading + 0.1 mF	Fluke 5522A Multiproduct Calibrator
Capacitance – Measure <sup>1</sup>	Up to 1 nF (1 to 10) nF (10 to 100) nF 100 nF to 1 μF (1 to 10) μF (10 to 100) μF 100 μF to 1 mF (1 to 10) mF (10 to 100) mF	1.8 nF/F + 1 pF 0.81 mF/F + 2 pF 0.49 mF/F + 10 pF 0.41 mF/F + 0.1 nF 0.42 mF/F + 1 nF 0.61 mF/F + 10 nF 0.62 mF/F + 0.1 μF 0.71 mF/F + 1 μF 0.71 mF/F + 10 μF	Fluke 8588A 8.5 Digit Multimeter
AC Voltage – Source <sup>1</sup>	Up to 2.2 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.24 mV/V + 4 μV 90 μV/V + 4 μV 80 μV/V + 4 μV 0.2 mV/V + 4 μV 0.5 mV/V + 5 μV 1.1 mV/V + 10 μV 1.4 mV/V + 20 μV 2.7 mV/V + 20 μV	Fluke 5730A 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 <sup>1</sup>	(2.2 to 22) mV		Fluke 5730A Multiproduct Calibrator
	(10 to 20) Hz	0.24 mV/V + 4 μV	
	(20 to 40) Hz	90 μV/V + 4 μV	
	40 Hz to 20 kHz	80 μV/V + 4 μV	
	(20 to 50) kHz	0.2 mV/V + 4 μV	
	(50 to 100) kHz	0.5 mV/V + 5 μV	
	(100 to 300) kHz	1.1 mV/V + 10 μV	
	(300 to 500) kHz	1.4 mV/V + 20 μV	
	500 kHz to 1 MHz	2.7 mV/V + 20 μV	
	(22 to 220) mV		
	(10 to 20) Hz	0.24 mV/V + 12 μV	
	(20 to 40) Hz	90 μV/V + 7 μV	
	40 Hz to 20 kHz	60 μV/V + 7 μV	
	(20 to 50) kHz	0.12 mV/V + 7 μV	
	(50 to 100) kHz	0.31 mV/V + 17 μV	
	(100 to 300) kHz	0.66 mV/V + 20 μV	
	(300 to 500) kHz	1.4 mV/V + 25 μV	
	500 kHz to 1 MHz	2.7 mV/V + 45 μV	
	220 mV to 2.2 V		
	(10 to 20) Hz	0.24 mV/V + 40 μV	
	(20 to 40) Hz	90 μV/V + 15 μV	
	40 Hz to 20 kHz	40 μV/V + 8 μV	
	(20 to 50) kHz	70 μV/V + 10 μV	
	(50 to 100) kHz	90 μV/V + 30 μV	
	(100 to 300) kHz	0.34 mV/V + 80 μV	
	(300 to 500) kHz	1 mV/V + 0.2 mV	
	500 kHz to 1 MHz	1.7 mV/V + 0.3 mV	
	(2.2 to 22) V		
(10 to 20) Hz	0.24 mV/V + 0.4 mV		
(20 to 40) Hz	90 μV/V + 0.15 mV		
40 Hz to 20 kHz	40 μV/V + 50 μV		
(20 to 50) kHz	70 μV/V + 0.1 mV		
(50 to 100) kHz	80 μV/V + 0.2 mV		
(100 to 300) kHz	0.25 mV/V + 0.6 mV		
(300 to 500) kHz	1 mV/V + 2 mV		
500 kHz to 1 MHz	1.5 mV/V + 3.2 mV		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source <sup>1</sup>	(22 to 220) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (220 to 1 100) V (15 to 50) Hz 50 Hz to 1 kHz	0.24 mV/V + 4 mV 90 μV/V + 1.5 mV 50 μV/V + 0.6 mV 80 μV/V + 1 mV 0.15 mV/V + 2.5 mV 0.9 mV/V + 16 mV 4.4 mV/V + 40 mV 8 mV/V + 80 mV 0.3 mV/V + 16 mV 70 μV/V + 3.5 mV	Fluke 5730A Multiproduct Calibrator
AC Voltage – Measure <sup>1</sup>	Up to 10 mV 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (10 to 100) mV 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz 100 mV to 1 V 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.29 mV/V + 1.1 μV 0.37 mV/V + 1.1 μV 0.38 mV/V + 1.1 μV 3 mV/V + 1.1 μV 10 mV/V + 4 μV 20 mV/V + 4 μV 88 μV/V + 0.5 μV 0.13 mV/V + 0.5 μV 0.23 mV/V + 1.0 μV 0.53 mV/V + 5.0 μV 2.1 mV/V + 30 μV 11 mV/V + 0.1 mV 15.4 mV/V + 0.5 mV 41 mV/V + 1 mV 84 mV/V + 1 mV 0.16 V/V + 1 mV 76 μV/V + 5 μV 0.12 mV/V + 5 μV 0.23 mV/V + 10 μV 0.53 mV/V + 50 μV 2.1 mV/V + 0.3 mV 10 mV/V + 1 mV 15 mV/V + 5 mV 40 mV/V + 10 mV 82 mV/V + 10 mV 0.15 V/V + 10 mV	Fluke 8588A 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
AC Voltage – Measure <sup>1</sup>	(1 to 10) V		Fluke 8588A 8.5 Digit Multimeter
	1 Hz to 2 kHz	76 $\mu$ V/V + 50 $\mu$ V	
	(2 to 10) kHz	0.12 mV/V + 50 $\mu$ V	
	(10 to 30) kHz	0.13 mV/V + 0.1 mV	
	(30 to 100) kHz	0.53 mV/V + 0.5 mV	
	(100 to 300) kHz	2.1 mV/V + 3 mV	
	300 kHz to 1 MHz	10 mV/V + 10 mV	
	(1 to 2) MHz	15 mV/V + 50 mV	
	(2 to 4) MHz	40 mV/V + 0.1 V	
	(4 to 8) MHz	82 mV/V + 0.1 V	
	(8 to 10) MHz	0.15 V/V + 0.1 V	
	(10 to 100) V		
	1 Hz to 2 kHz	90 $\mu$ V/V + 0.5 mV	
	(2 to 10) kHz	0.11 mV/V + 0.5 mV	
	(10 to 30) kHz	0.23 mV/V + 1 mV	
(30 to 100) kHz	0.59 mV/V + 5 mV		
(100 to 300) kHz	3.7 mV/V + 50 mV		
300 kHz to 1 MHz	10.1 mV/V + 0.5 V		
(100 to 1 000) V			
1 Hz to 2 kHz	0.11 mV/V + 25 mV		
(2 to 10) kHz	0.11 mV/V + 25 mV		
(10 to 30) kHz	0.23 mV/V + 25 mV		
(30 to 100) kHz	0.59 mV/V + 0.1 V		
AC High Voltage – Measure <sup>1</sup>	(50 to 60) Hz (1 to 5) kV	0.15 % of reading	Vitrek 4700 High Voltage Meter
AC Current – Source <sup>1</sup>	Up to 220 $\mu$ A		Fluke 5730A Multiproduct Calibrator
	(10 to 20) Hz	0.25 mA/A + 16 nA	
	(20 to 40) Hz	0.16 mA/A + 10 nA	
	40 Hz to 1 kHz	0.1 mA/A + 8 nA	
	(1 to 5) kHz	0.28 mA/A + 12 nA	
	(5 to 10) kHz	1.1 mA/A + 65 nA	
	220 $\mu$ A to 2.2 mA		
	(10 to 20) Hz	0.25 mA/A + 40 nA	
	(20 to 40) Hz	0.16 mA/A + 35 nA	
	40 Hz to 1 kHz	0.1 mA/A + 35 nA	
	(1 to 5) kHz	0.2 mA/A + 0.11 $\mu$ A	
	(5 to 10) kHz	1.1 mA/A + 0.65 $\mu$ A	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source <sup>1</sup>	(2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.25 mA/A + 0.4 μA 0.16 mA/A + 0.35 μA 0.1 mA/A + 0.35 μA 0.2 mA/A + 0.55 μA 1.1 mA/A + 5 μA 0.25 mA/A + 4 μA 0.16 mA/A + 3.5 μA 0.1 mA/A + 2.5 μA 0.2 mA/A + 3.5 μA 1.1 mA/A + 10 μA 0.24 mA/A + 35 μA 0.45 μA/A + 80 μA 7 mA/A + 0.16 mA	Fluke 5730A Multiproduct Calibrator
AC Current – Source <sup>1</sup>	(1.1 to 2.999) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 10.999) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.14 % of reading + 0.1 mA 0.04 % of reading + 0.1 mA 0.5 % of reading + 1 mA 1.9 % of reading + 5 mA 0.05 % of reading + 2 mA 0.08 % of reading + 2 mA 2.3 % of reading + 2 mA 0.09 % of reading + 5 mA 0.12 % of reading + 5 mA 2.3 % of reading + 5 mA	Fluke 5522A Multiproduct Calibrator
AC Current – Measure <sup>1</sup>	Up to 10 μA 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (10 to 100) μA 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	2 mA/A + 2.5 nA 2 mA/A + 2.5 nA 2 mA/A + 2.5 nA 0.28 mA/A + 5 nA 0.53 mA/A + 5 nA 0.74 mA/A + 5 nA 4 mA/A + 10 nA	Fluke 8588A 8.5 Digit Multimeter

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure <sup>1</sup>	100 $\mu$ A to 1 mA		Fluke 8588A 8.5 Digit Multimeter
	1 Hz to 2 kHz	0.28 mA/A + 50 nA	
	(2 to 10) kHz	0.53 mA/A + 50 nA	
	(10 to 30) kHz	0.74 mA/A + 50 nA	
	(30 to 100) kHz	4 mA/A + 0.1 $\mu$ A	
	(1 to 10) mA		
	1 Hz to 2 kHz	0.28 mA/A + 0.5 $\mu$ A	
	(2 to 10) kHz	0.53 mA/A + 0.5 $\mu$ A	
	(10 to 30) kHz	0.74 mA/A + 0.5 $\mu$ A	
	(30 to 100) kHz	4 mA/A + 1 $\mu$ A	
	(10 to 100) mA		
	1 Hz to 2 kHz	0.28 mA/A + 5 $\mu$ A	
	(2 to 10) kHz	0.52 mA/A + 5 $\mu$ A	
	(10 to 30) kHz	0.74 mA/A + 5 $\mu$ A	
100 mA to 1 A			
1 Hz to 2 kHz	0.3 mA/A + 0.1 mA		
(2 to 10) kHz	0.55 mA/A + 0.1 mA		
(10 to 30) kHz	0.79 mA/A + 0.1A		
(1 to 10) A			
10 Hz to 2 kHz	0.84 mA/A + 1 mA		
(2 to 10) kHz	0.84 mA/A + 1mA		
(10 to 30) A			
10 Hz to 2 kHz	0.8 mA/A + 12 mA		
2 kHz to 10 kHz	1.2 mA/A + 12 mA		
AC Current – Source Clamp-on Meters <sup>1</sup>	60 Hz (10 to 100) A (100 to 500) A	0.19 A 1.19 A	Transmille EA002 Coil Adapter, Fluke 5522A Multiproduct Calibrator
Oscilloscopes <sup>1</sup> Amplitude – DC			Fluke 5522A Multiproduct Calibrator with 1 100 MHz Scope Option
50 $\Omega$ load	0 V	12 mV	
	6 V	12 mV	
1 M $\Omega$ load	0 V	12 mV	
	66 V	43 mV	
	130 V	76 mV	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes <sup>1</sup>			
Amplitude – Square wave into 50 Ω load	0.1 V <sub>p-p</sub> 10 kHz	5.9 mV	Fluke 5522A Multiproduct Calibrator with 1 100 MHz Scope Option
	1 V <sub>p-p</sub> 10 kHz	5.9 mV	
	5 V <sub>p-p</sub> 10 kHz	15 mV	
into 1 MΩ load	0.1 V <sub>p-p</sub> 10 kHz	0.43 mV	
	1 V <sub>p-p</sub> 10 kHz	2.6 mV	
	10 V <sub>p-p</sub> 10 kHz	6.4 mV	
Leveled Sine Flatness (relative to 50 kHz) into 50 Ω load	10 mV <sub>p-p</sub> 50 kHz	0.58 mV	
	30 mV <sub>p-p</sub> 100 kHz	2.1 mV	
	300 MHz	2.6 mV	
	600 MHz	5 mV	
	5 V <sub>p-p</sub> 50 kHz	0.36 mV	
	100 kHz	1.7 mV	
	300 MHz	2.3 mV	
	600 MHz	4.6 mV	
Rise Time			
1 MHz	1 V <sub>p-p</sub> Up to 400 ps	8.3 ps	
10 MHz	0.5 V <sub>p-p</sub> Up to 400 ps	8.2 ps	
	1 V <sub>p-p</sub> Up to 400 ps	8.2 ps	



ANSI National Accreditation Board

Electrical – DC/Low Frequency

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Oscilloscopes <sup>1</sup> Time Markers	2 ns 20 ms 50 ms 5 s	10 ps 12 μs 10 μs 40 ms	Fluke 5522A Multiproduct Calibrator with 1 100 MHz Scope Option
Electrical Simulation of RTD Indicating Devices <sup>1</sup>	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 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 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 Pt 385, 1 000 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	0.23 °C  0.04 °C 0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C  0.03 °C 0.03 °C 0.03 °C 0.04 °C 0.09 °C 0.1 °C 0.11 °C 0.12 °C  0.03 °C 0.04 °C 0.04 °C 0.05 °C 0.06 °C 0.06 °C 0.07 °C 0.09 °C  0.02 °C 0.02 °C 0.03 °C 0.04 °C 0.05 °C 0.05 °C 0.05 °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 <sup>1</sup>	Pt 3926, 100 Ω		Fluke 5522A Multiproduct Calibrator
	(-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	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.19 °C	
	(-190 to -80) °C	0.03 °C	
	(-80 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °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	0.08 °C		
(600 to 630) °C	0.18 °C		
PtNi 385, 120 Ω			
(-80 to 0) °C	0.06 °C		
(0 to 100) °C	0.06 °C		
(100 to 260) °C	0.11 °C		
Electrical Simulation of Thermocouple – Measure/Source <sup>1</sup>	Type B		Fluke 5522A Multiproduct Calibrator
	(600 to 800) °C	0.34 °C	
	(800 to 1 000) °C	0.26 °C	
	(1 000 to 1 550) °C	0.23 °C	
	(1 550 to 1 820) °C	0.26 °C	
	Type C		
	(0 to 150) °C	0.23 °C	
	(150 to 650) °C	0.2 °C	
	(650 to 1 000) °C	0.24 °C	
	(1 000 to 1 800) °C	0.39 °C	
	(1 800 to 2 316) °C	0.65 °C	
	Type E		
	(-250 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.12 °C	
	(-25 to 350) °C	0.11 °C	
(350 to 650) °C	0.12 °C		
(650 to 1 000) °C	0.16 °C		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple – Measure/Source <sup>1</sup>	Type J		Fluke 5522A Multiproduct Calibrator
	(-210 to -100) °C	0.21 °C	
	(-100 to -30) °C	0.12 °C	
	(-30 to 150) °C	0.11 °C	
	(150 to 760) °C	0.13 °C	
	(760 to 1 200) °C	0.18 °C	
	Type K		
	(-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		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple – Measure/Source <sup>1</sup>	Type U (-200 to 0) °C (0 to 600) °C	0.43 °C 0.21 °C	Fluke 5522A Multiproduct Calibrator

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks <sup>2</sup>	(0.01 to 4) in	(3.1 + 1L) μin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks
Long Gage Blocks <sup>2</sup>	(4 to 20) in	(2.5 + 1.2L) μin	Pratt & Whitney LMU-1000M Comparator, Grade 0 Gage Blocks
Thread Measuring Wires (4 to 120) TPI	(0.004 81 to 0.144 352) in	8.8 μin	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 μin 9.7 μin 19 μin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks
Z-Mike Laser Micrometer	Up to 1 in	31 μin	Class XXX Pins
Pins	Up to 1 in	43 μin	Z-Mike Laser Micrometer
Thread Plugs (Pitch Diameter)	Up to 1 in (1 to 3) in (3 to 7.5) in	14 μin 35 μin 61 μin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks, Thread Measuring Wires
Thread Plugs (Pitch Diameter)	(7.5 to 12) in	71 μin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks, Thread Measuring Wires
NPT Thread Plugs (Pitch Diameter)	Up to 1 in (1 to 3) in (3 to 6) in	16 μin 18 μin 29 μin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks, Thread Measuring Wires
Thread Rings	Up to 1 in (1 to 4) in (4 to 8) in	20 μin 35 μin 59 μin	Pratt & Whitney LMU-2130 Comparator, Class XXX Plain Rings

**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 8) in (8 to 12) in	12 $\mu$ in 15 $\mu$ in 25 $\mu$ in 32 $\mu$ in	Pratt & Whitney LMU-2130 Comparator, Class XXX Plain Rings
Plain Rings	(12 to 18) in	33 $\mu$ in	Pratt & Whitney LMU-1000M Comparator, Class XXX Plain Rings
Micrometers <sup>1,2</sup> (OD, ID, Bore, Depth) (0.001 in resolution) (0.000 1 in resolution) (0.000 05 in resolution)	(0.05 to 72) in (0.05 to 72) in (0.05 to 24) in	(580 + 1.1L) $\mu$ in (58 + 3.6L) $\mu$ in (29 + 3.4L) $\mu$ in	Grade 2 Gage Blocks, Optical Flat
Calipers <sup>1,2</sup> (Dial, Vernier, & Digital) (0.001 in resolution) (0.000 5 in resolution)	(0.05 to 120) in (0.05 to 120) in	(580 + 1.7L) $\mu$ in (290 + 2.6L) $\mu$ in	Grade 2 Gage Blocks, Optical Flat
Indicator Calibrators	Up to 1 in	59 $\mu$ in	Grade 2 Gage Blocks, Optical Flat
Height Gages <sup>1</sup>	Up to 12 in (12 to 48) in	600 $\mu$ in 615 $\mu$ in	Grade 2 Gage Blocks, Optical Flat
Dial and Digital Indicators <sup>1</sup> (0.001 in resolution) (0.000 1 in resolution) (0.000 05 in resolution) (0.000 02 in resolution) (0.000 01 in resolution)	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 $\mu$ in 140 $\mu$ in 58 $\mu$ in 34 $\mu$ in 14 $\mu$ in	Grade 2 Gage Blocks, Indicator Calibrator
Surface Plates <sup>1,2</sup>  Overall Flatness  Local Area Flatness (Repeat Reading)	  Up to 16.97 DL Up to 21.63 DL Up to 60 DL Up to 161 DL  Up to 0.000 02 in	  52 $\mu$ in 56 $\mu$ in 240 $\mu$ in 240 $\mu$ in  55 $\mu$ in	  In accordance with Fed Spec GGG-P-463 using Planekator, Straight Indicators  Repeat-o-Meter
Length Standards <sup>2</sup>	(0.5 to 4) in (5 to 20) in (21 to 42) in (43 to 96) in	(3.9 + 1.5L) $\mu$ in (29 + 0.9L) $\mu$ in (18 + 1L) $\mu$ in (9.7 + 2.1L) $\mu$ in	Pratt & Whitney LMU-2130 Comparator, Pratt & Whitney LMU-1000 Comparator Grade 1 Gage Blocks, Electronic Indicator

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital Levels <sup>1</sup>	0° 15° 30° 45° 90°	0.06° 0.13° 0.15° 0.15° 0.13°	Grade 2 Gage Blocks, Sine Bar
Parallels	Up to 4 in	10 µin	Pratt & Whitney LMU-2130 Comparator, Grade 1 Gage Blocks
Optical Comparators <sup>1</sup> X, Y Axis Length	Up to 6 in	900 µin	Glass Scale Standard, Check Balls
Roughness Specimen	Ra: (0.8 to 500) µin	0.34 % of reading + 1.1 µin	Mitutoyo Surface Roughness Tester, Contour Measuring Machine

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Low Pressure Devices <sup>1</sup> (Pneumatic Gauge Pressure)	(0.01 to 30) inH <sub>2</sub> O	0.096 % of reading + 0.001 2 inH <sub>2</sub> O	Additel Pressure Module
Hydraulic Pressure Devices <sup>1</sup> (Gauge Pressure)	(10 to 16 000) psig (16 000 to 20 000) psig	0.009 4 % of reading 0.015 % of reading + 0.4 psi	Hydraulic Deadweight Testers Fluke P3125 Fluke 3116
Vacuum Devices <sup>1</sup> (Pneumatic)	(-15 to -0.1) psig	0.003 8 psi	Additel 673 Digital Pressure Calibrator
Torque Tools <sup>1</sup>	(20 to 200) ozf·in (5 to 50) lbf·in (40 to 400) lbf·in (100 to 1 000) lbf·in (25 to 250) lbf·ft (50 to 500) lbf·ft (100 to 1 000) lbf·ft (200 to 2 000) lbf·ft	0.11 % of reading + 1.5 ozf·in 0.067 % of reading + 0.48 lbf·in 0.17 % of reading + 1 lbf·in 0.22 % of reading + 1.8 lbf·in 0.2 % of reading + 0.49 lbf·ft 0.27 % of reading + 2.6 lbf·ft 0.21 % of reading + 7.2 lbf·ft 0.056 % of reading + 37 lbf·ft	CDI Sure-test 5000-ST Torque Calibration System
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



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**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Durometers Spring Force Only Types A, B, E, O Types C, D, DO	(0 to 8.05) N (0 to 44.45) N	0.089 N 0.53 N	Partial Direct Verification per internal procedure CP-0053 using Triple Beam Balance
Class F Mass Determination	(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; NIST HB 105-1
Balances and Scales <sup>1</sup> 0.1 mg resolution	Up to 10 g Up to 200 g	0.2 mg 0.3 mg	ASTM E617 Class 0 weights and NIST Handbook 44 utilized in the calibration of the weighing device.
Balances and Scales <sup>1</sup> 0.1 mg resolution	(200 to 600) g (600 to 6 000) g	15 mg 22 mg	ASTM E617 Class 0 weights and NIST Handbook 44 utilized in the calibration of the weighing device.
Balances and Scales <sup>1</sup> 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 and NIST Handbook 44 utilized in the calibration of the weighing device.
Balances and Scales <sup>1</sup> 0.000 2 lb resolution 0.000 5 lb resolution 0.001 lb resolution 0.005 lb resolution 0.002 lb resolution 0.005 lb resolution	Up to 2 lb Up to 5 lb Up to 10 lb Up to 20 lb Up to 25 lb Up to 50 lb	0.000 4 lb 0.001 lb 0.002 lb 0.01 lb 0.004 lb 0.01 lb	NIST Class F weights and NIST Handbook 44 utilized in the calibration of the weighing device.

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales <sup>1</sup> 0.01 lb resolution 0.05 lb resolution 0.05 lb resolution 0.2 lb resolution 0.5 lb resolution 1 lb resolution 2 lb resolution 20 lb resolution	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	0.03 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 and NIST Handbook 44 utilized in the calibration of the weighing device.
Force Measuring Devices	Up to 1 000 lbf	0.1 % of reading	Morehouse Load Cells with Readout

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Source <sup>1</sup> (Temperature Measuring Devices)	(-5 to 140) °C	0.24 °C	Hart Scientific 9105 Drywell
Temperature – Source <sup>1</sup> (Temperature Measuring Devices)	(0 to 260) °C	0.69 °C	Hart 6102 Micro-bath
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
Drywell Calibrators <sup>1</sup>	(-40 to 600) °C	0.058 °C	Platinum Resistance Thermometer, Multifunction Reference Thermometer
Temperature Baths <sup>1</sup>	(-40 to 300) °C	0.053 °C	Platinum Resistance Thermometer, Multifunction Reference Thermometer
RTD Probes <sup>1</sup> (3 Wires & 4 Wire Sensors)	(-40 to 400) °C	0.3 °C	Drywell Calibrator? Platinum Resistance Thermometer, Multifunction Reference Thermometer

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Infrared Thermometers	50 °C 100 °C 200 °C 300 °C 390 °C	0.62 °C 1.1 °C 1.5 °C 2.4 °C 3.3 °C	Fluke 4181 Infrared Calibrator (flat plate) $\epsilon = 0.95, \lambda = (8 \text{ to } 14) \mu\text{m}$

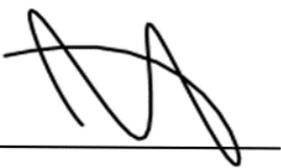
**Time and Frequency**

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



Jason Stine, Vice President