



# CERTIFICATE OF ACCREDITATION

**The ANSI National Accreditation Board**

Hereby attests that

**McCune's Instruments, Inc.**  
**108 North Lee Street**  
**Spokane, WA 99202**

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).

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Jason Stine, Vice President  
Expiry Date: 12 May 2025  
Certificate Number: AC-2048



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)**

**McCune's Instruments, Inc.**

108 North Lee Street

Spokane, WA 99202

Mike McCune

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**CALIBRATION**

Valid to: **May 12, 2025**

Certificate Number: **AC-2048**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple mV Simulation <sup>1,3</sup>	Type B (600 to 800) °C (800 to 1 000) °C (1 000 to 1 550) °C (1 550 to 1 820) °C	0.44 °C 0.34 °C 0.3 °C 0.33 °C	Comparison to Fluke 5520A Multiproduct Calibrator
	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	0.3 °C 0.26 °C 0.31 °C 0.5 °C 0.84 °C	
	Type E (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1 000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	
	Type J (-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1 200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thermocouple mV Simulation <sup>1,3</sup>	Type K		Comparison to Fluke 5520A Multiproduct Calibrator
	(-200 to -100) °C	0.33 °C	
	(-100 to -25) °C	0.18 °C	
	(-25 to 120) °C	0.16 °C	
	(120 to 1 000) °C	0.26 °C	
	(1 000 to 1 372) °C	0.4 °C	
	Type L		
	(-200 to -100) °C	0.37 °C	
	(-100 to 800) °C	0.26 °C	
	(800 to 900) °C	0.17 °C	
	Type N		
	(-200 to -100) °C	0.4 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 410) °C	0.18 °C	
	(410 to 1 300) °C	0.27 °C	
	Type R		
(0 to 250) °C	0.57 °C		
(250 to 400) °C	0.35 °C		
(400 to 1 000) °C	0.33 °C		
(1 000 to 1 760) °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	0.24 °C		
(0 to 120) °C	0.16 °C		
(120 to 400) °C	0.14 °C		
DC Voltage – Generate <sup>1,3</sup>	(0 to 329.999) mV	20 μV/V + 1 μV	Comparison to Fluke 5520A Multiproduct Calibrator
	(0.33 to 3.299 9) V	11 μV/V + 2 μV	
	(3.3 to 32.999) V	12 μV/V + 20 μV	
	(33 to 329.999) V	18 μV/V + 0.15 mV	
	(100 to 1 000) V	18 μV/V + 1.5 mV	
DC Voltage – Measure <sup>1,3</sup>	Up to 202 mV	7.5 μV/V + 0.4 μV	Comparison to Digital Multimeter
	200 mV to 2.02 V	4 μV/V + 0.6 μV	
	(2 to 20.2) V	4 μV/V + 1 μV	
	(20 to 202) V	6.5 μV/V + 61 μV	
	(200 to 1 050) V	6.7 μV/V + 0.53 mV	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC High Voltage – Measure <sup>1,3</sup>	Up to 10 kV (10 to 90) kV	0.26 % of reading + 2 V 0.55 % of reading	Comparison to High Voltage Meter
AC Voltage – Generate <sup>1,3</sup>	(1 to 32.999) mV (10 to 45) Hz	0.8 mV/V + 6 μV	Comparison to Fluke 5520A Multiproduct Calibrator
	45 Hz to 10 kHz (10 to 20) kHz	0.14 mV/V + 6 μV 0.2 mV/V + 6 μV	
	(20 to 50) kHz (50 to 100) kHz	0.1 % of reading + 6 μV 0.35 % of reading + 12 μV	
	(100 to 500) kHz	0.8 % of reading + 50 μV	
	(33 to 329.999) mV (10 to 45) Hz	0.3 mV/V + 8 μV	
	45 Hz to 10 kHz (10 to 20) kHz	0.14 mV/V + 8 μV 0.16 mV/V + 8 μV	
	(20 to 50) kHz (50 to 100) kHz	0.35 mV/V + 8 μV 0.8 mV/V + 32 μV	
	(100 to 500) kHz	0.2 % of reading + 70 μV	
	0.33 to 3.299 V (10 to 45) Hz	0.3 mV/V + 50 μV	
	45 Hz to 10 kHz (10 to 20) kHz	0.15 mV/V + 60 μV 0.19 mV/V + 60 μV	
	(20 to 50) kHz (50 to 100) kHz	0.3 mV/V + 50 μV 0.7 mV/V + 0.13 mV	
	(100 to 500) kHz	0.24 % of reading + 0.6 mV	
	(3.3 to 32.999) V (10 to 45) Hz	0.3 mV/V + 0.65 mV	
	45 Hz to 10 kHz (10 to 20) kHz	0.15 mV/V + 0.6 mV 0.24 mV/V + 0.6 mV	
	(20 to 50) kHz (50 to 100) kHz	0.35 mV/V + 0.6 mV 0.9 mV/V + 1.6 mV	
	(33 to 329.999) V 45 Hz to 1 kHz	0.19 mV/V + 2 mV	
	(1 to 10) kHz (10 to 20) kHz	0.2 mV/V + 6 mV 0.25 mV/V + 6 mV	
	(20 to 50) kHz (50 to 100) kHz	0.3 mV/V + 6 mV 0.2 % of reading + 50 mV	
	(330 to 1 020) V 45 Hz to 1 kHz	0.3 mV/V + 10 mV	
	(1 to 5) kHz (5 to 10) kHz	0.25 mV/V + 10 mV 0.3 mV/V + 10 mV	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure <sup>1,3</sup>	Up to 12 mV		Comparison to Digital Multimeter
	1 Hz to 2 kHz	0.29 mV/V + 1.3 μV	
	(2 to 10) kHz	0.37 mV/V + 1.3 μV	
	(10 to 30) kHz	0.38 mV/V + 1.3 μV	
	(30 to 100) kHz	0.3 % of reading + 1.3 μV	
	(100 to 300) kHz	1 % of reading + 4.8 mV	
	300 kHz to 1 MHz	2 % of reading + 4.8 mV	
	(12 to 121) mV		
	1 Hz to 2 kHz	88 μV/V + 0.61 μV	
	(2 to 10) kHz	0.13 mV/V + 0.61 μV	
	(10 to 30) kHz	0.23 mV/V + 1.2 μV	
	(30 to 100) kHz	0.53 mV/V + 6 μV	
	(100 to 300) kHz	0.21 % of reading + 36 μV	
	300 kHz to 1 MHz	1.1 % of reading + 0.12 mV	
	(1 to 2) MHz	1.5 % of reading + 0.6 mV	
	(2 to 4) MHz	4.1 % of reading + 1.2 mV	
	(4 to 8) MHz	8.4 % of reading + 1.2 mV	
	(8 to 10) MHz	16 % of reading + 1.2 mV	
	120 mV to 1.212 V		
	1 Hz to 2 kHz	76 μV/V + 6 μV	
	(2 to 10) kHz	0.12 mV/V + 6 μV	
	(10 to 30) kHz	0.23 mV/V + 12 μV	
	(30 to 100) kHz	0.53 mV/V + 61 μV	
	(100 to 300) kHz	0.21 % of reading + 0.36 mV	
300 kHz to 1 MHz	1 % of reading + 1.2 mV		
(1 to 2) MHz	1.5 % of reading + 6.1 mV		
(2 to 4) MHz	4 % of reading + 1.2 mV		
(4 to 8) MHz	8.2 % of reading + 1.2 mV		
(8 to 10) MHz	15 % of reading + 1.2 mV		
(1.2 to 12.12) V			
1 Hz to 2 kHz	76 μV/V + 61 μV		
(2 to 10) kHz	0.12 mV/V + 61 μV		
(10 to 30) kHz	0.23 mV/V + 0.12 mV		
(30 to 100) kHz	0.53 mV/V + 0.61 mV		
(100 to 300) kHz	0.21 % of reading + 3.6 mV		
300 kHz to 1 MHz	1 % of reading + 12 mV		
(1 to 2) MHz	1.5 % of reading + 61 mV		
(2 to 4) MHz	4 % of reading + 0.12 V		
(4 to 8) MHz	8.2 % of reading + 0.12 V		
(8 to 10) MHz	15 % of reading + 0.12 V		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure <sup>1,3</sup>	(12 to 121.2) 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	90 $\mu$ V/V + 0.6 mV 0.11 mV/V + 0.6 mV 0.23 mV/V + 1.2 mV 0.51 mV/V + 6 mV 0.37 % of reading + 60 mV 1.1 % of reading + 0.6 V	Comparison to Digital Multimeter
	(120 to 1 050) V 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.11 mV/V + 26 mV 0.11 mV/V + 26 mV 0.23 mV/V + 26 mV 0.59 mV/V + 0.1 V	
AC Voltage – Measure <sup>1,3</sup>	(50 to 60) Hz Up to 10 kV (10 to 70) kV	0.7 % of reading + 16 V 1.4 % of reading	Comparison to High Voltage Meter
DC Current – Generate <sup>1,3</sup>	(0 to 329.999) $\mu$ A (0 to 3.299) mA (0 to 32.999) mA (0 to 329.999) mA (0 to 1.099) A (1.1 to 2.999 99) A	0.15 mA/A + 20 nA 0.1 mA/A + 50 nA 0.1 mA/A + 0.25 $\mu$ A 0.1 mA/A + 2.5 $\mu$ A 0.2 mA/A + 40 $\mu$ A 0.38 mA/A + 40 $\mu$ A	Comparison to Fluke 5520A Multiproduct Calibrator
DC Current – Generate <sup>1,3</sup> 20A Range	(0 to 10.999) A (11 to 20.5) A	0.5 mA/A + 0.5 mA 0.1 % of reading + 0.75 mA	Comparison to Fluke 5520A Multiproduct Calibrator
DC Current – Generate <sup>1,3</sup>	(20 to 150) A (150 to 550) A (550 to 1 000) A	0.26 % of reading + 16 mA 0.26 % of reading + 56 mA 0.27 % of reading + 63 mA	Comparison to Fluke 5520A Multiproduct Calibrator, Current Coil
DC Current – Measure <sup>1,3</sup>	Up to 20.2 $\mu$ A (20 to 202) $\mu$ A 200 $\mu$ A to 2.02 mA (2 to 20.2) mA (20 to 202) mA 200 mA to 2.02 A (2 to 20.2) A (20 to 30.2) A	27 $\mu$ A/A + 0.81 nA 9.8 $\mu$ A/A + 0.8 nA 9.2 $\mu$ A/A + 8.1 nA 14 $\mu$ A/A + 80 nA 57 $\mu$ A/A + 2 $\mu$ A 0.13 mA/A + 0.2 mA 0.23 mA/A + 0.8 mA 0.55 mA/A + 4.4 mA	Comparison to Digital Multimeter
DC Current – Measure <sup>1,3</sup>	(2 to 20) A	0.11 mA/A + 40 $\mu$ A	Comparison to Current Shunt, Digital Multimeter

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Generate <sup>1,3</sup>	(29 to 329.99) $\mu$ A		Comparison to Multiproduct Calibrator
	(10 to 20) Hz	0.2 % of reading + 0.1 $\mu$ A	
	(20 to 45) Hz	0.15 % of reading + 0.1 $\mu$ A	
	45 Hz to 1 kHz	0.13 % of reading + 0.1 $\mu$ A	
	(1 to 5) kHz	0.3 % of reading + 0.15 $\mu$ A	
	(5 to 10) kHz	0.8 % of reading + 0.2 $\mu$ A	
	(10 to 30) kHz	1.6 % of reading + 0.4 $\mu$ A	
	(0.33 to 3.299) mA		
	(10 to 20) Hz	0.2 % of reading + 0.15 $\mu$ A	
	(20 to 45) Hz	0.13 % of reading + 0.15 $\mu$ A	
	45 Hz to 1 kHz	0.1 % of reading + 0.15 $\mu$ A	
	(1 to 5) kHz	0.2 % of reading + 0.2 $\mu$ A	
	(5 to 10) kHz	0.5 % of reading + 0.3 $\mu$ A	
	(10 to 30) kHz	1 % of reading + 0.6 $\mu$ A	
	(3.3 to 32.999) mA		
	(10 to 20) Hz	0.18 % of reading + 2 $\mu$ A	
	(20 to 45) Hz	0.09 % of reading + 2 $\mu$ A	
	45 Hz to 1 kHz	0.04 % of reading + 2 $\mu$ A	
	(1 to 5) kHz	0.08 % of reading + 2 $\mu$ A	
	(5 to 10) kHz	0.2 % of reading + 3 $\mu$ A	
	(10 to 30) kHz	0.4 % of reading + 4 $\mu$ A	
	(33 to 329.99) mA		
	(10 to 20) Hz	0.18 % of reading + 20 $\mu$ A	
	(20 to 45) Hz	0.09 % of reading + 20 $\mu$ A	
45 Hz to 1 kHz	0.04 % of reading + 20 $\mu$ A		
(1 to 5) kHz	0.1 % of reading + 50 $\mu$ A		
(5 to 10) kHz	0.2 % of reading + 0.1 mA		
(10 to 30) kHz	0.4 % of reading + 0.2 mA		
(0.3 to 1.099 9) A			
(10 to 45) Hz	0.18 % of reading + 0.1 mA		
45 Hz to 1 kHz	0.05 % of reading + 0.1 mA		
(1 to 5) kHz	0.6 % of reading + 1 mA		
(5 to 10) kHz	2.5 % of reading + 5 mA		
(1.1 to 2.999) A			
(10 to 45) Hz	0.18 % of reading + 0.1 mA		
45 Hz to 1 kHz	0.06 % of reading + 0.1 mA		
(1 to 5) kHz	0.6 % of reading + 1 mA		
(5 to 10) kHz	2.5 % of reading + 5 mA		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Generate <sup>1,3</sup>	(3 to 10.999) A (45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.06 % of reading + 2 mA 0.1 % of reading + 2 mA 3 % of reading + 2 mA	Comparison to Fluke 5520A Multiproduct Calibrator
	(11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % of reading + 5 mA 0.15 % of reading + 5 mA 3 % of reading + 5 mA	
AC Current – Generate <sup>1,3</sup> Clamp Meters	(20 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 000) A (45 to 65) Hz (65 to 440) H	0.31 % of reading + 10 mA 0.85 % of reading + 57 mA  0.3 % of reading + 0.14 A 1.3 % of reading + 0.11 A	Comparison to Fluke 5520A Multiproduct Calibrator, Current Coil
AC Current – Measure <sup>1,3</sup>	Up to 20.2 $\mu$ A 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	2 mA/A + 5 nA 2 mA/A + 5 nA 2 mA/A + 5 nA	Comparison to Digital Multimeter
	(20 to 202) $\mu$ A 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.28 mA/A + 10 nA 0.53 mA/A + 10 nA 0.74 mA/A + 10 nA 4 mA/A + 20 nA	
	200 $\mu$ A to 2.02 mA 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.28 mA/A + 0.1 $\mu$ A 0.53 mA/A + 0.1 $\mu$ A 0.74 mA/A + 0.1 $\mu$ A 4 mA/A + 0.2 $\mu$ A	
	(2 to 20.2) mA 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.28 mA/A + 1 $\mu$ A 0.53 mA/A + 1 $\mu$ A 0.74 mA/A + 1 $\mu$ A 4.1 mA/A + 2 $\mu$ A	
	(20 to 202) mA 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.28 mA/A + 10 $\mu$ A 0.52 mA/A + 10 $\mu$ A 0.74 mA/A + 10 $\mu$ A	
	200 mA to 2.02 A 1 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.3 mA/A + 0.2 mA 0.55 mA/A + 0.2 mA 0.79 mA/A + 0.2 mA	



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure <sup>1,3</sup>	(2 to 20.2) A 10 Hz to 2 kHz (2 to 10) kHz (20 to 30.2) A 1 Hz to 2 kHz (2 to 10) kHz	0.84 mA/A + 1 mA 0.84 mA/A + 1 mA 0.84 mA/A + 12 mA 1.2 mA/A + 12 mA	D Comparison to digital Multimeter
AC Current – Measure <sup>1,3</sup>	(2 to 20) A 10 Hz to 2 kHz	0.04 % of reading + 0.6 mA	Comparison to Current Shunt, Digital Multimeter
Resistance – Generate <sup>1,3</sup>	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	40 μΩ/Ω + 1 mΩ 30 μΩ/Ω + 1.5 mΩ 28 μΩ/Ω + 1.4 mΩ 28 μΩ/Ω + 2 mΩ 28 μΩ/Ω + 2 mΩ 28 μΩ/Ω + 20 mΩ 28 μΩ/Ω + 20 mΩ 28 μΩ/Ω + 0.2 Ω 28 μΩ/Ω + 0.2 Ω 32 μΩ/Ω + 2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 0.13 mΩ/Ω + 50 Ω 0.25 mΩ/Ω + 2.5 kΩ 0.5 mΩ/Ω + 3 kΩ 3 mΩ/Ω + 0.1 MΩ 15 mΩ/Ω + 0.5 MΩ	Comparison to Fluke 5520A Multiproduct Calibrator
Resistance – Measure <sup>1,3</sup>	Up to 2.02 Ω (2 to 20.2) Ω (20 to 202) Ω 200 Ω to 2.02 kΩ (2 to 20.2) kΩ (20 to 202) kΩ 200 kΩ to 2.02 MΩ (2 to 20.2) MΩ (20 to 202) MΩ 200 MΩ to 2.02 GΩ (2 to 20.2) GΩ	17 μΩ/Ω + 8 μΩ 10 μΩ/Ω + 28 μΩ 9.2 μΩ/Ω + 0.1 mΩ 9.1 μΩ/Ω + 1 mΩ 9.2 μΩ/Ω + 10 mΩ 9.3 μΩ/Ω + 0.1 Ω 11 μΩ/Ω + 2 Ω 17 μΩ/Ω + 20 Ω 68 μΩ/Ω + 0.2 kΩ 0.23 mΩ/Ω + 2 kΩ 1.3 mΩ/Ω + 20 kΩ	Comparison to Digital Multimeter

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RTD Resistance Simulation <sup>1,3</sup>	Pt 385, 100 Ω (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C 400 to 630) °C (630 to 800) °C Pt 3926, 100 Ω (-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °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	0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.23 °C 0.05 °C 0.07 °C 0.09 °C 0.1 °C 0.12 °C 0.25 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.23 °C	Comparison to Fluke 5520A Multiproduct Calibrator
RTD Resistance Simulation <sup>1,3</sup>	Pt 385, 200 Ω (-200 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 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C 0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C	Comparison to Fluke 5520A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance Simulation <sup>1,3</sup>	(0.19 to 3.299) nF (3.3 to 10.999) nF (11 to 109.999) nF (110 to 329.999) nF 330 nF to 1.099 μF (1.1 to 3.299) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.999) μF (110 to 329.999) μF 330 nF to 1.099 mF (1.1 to 3.299) mF (3.3 to 10.999) mF (11 to 32.999) mF (33 to 110) mF	0.5 % of reading + 10 pF 0.25 % of reading + 10 pF 0.25 % of reading + 0.1 nF 0.25 % of reading + 0.3 nF 0.25 % of reading + 1 nF 0.25 % of reading + 3 nF 0.25 % of reading + 10 nF 0.4 % of reading + 30 nF 0.45 % of reading + 0.1 μF 0.45 % of reading + 0.3 μF 0.45 % of reading + 1 μF 0.45 % of reading + 3 μF 0.45 % of reading + 10 μF 0.75 % of reading + 30 μF 1.1 % of reading + 0.1 mF	Comparison to Fluke 5520A Multiproduct Calibrator
Capacitance – Measure <sup>1</sup>	Up to 2.02 nF (1.8 to 20.2) nF (18 to 202) nF (0.18 to 2.02) μF (1.8 to 20.2) μF (18 to 202) μF (0.18 to 2.02) mF (1.8 to 20.2) mF (18 to 202) mF	1.8 mF/F + 2 pF 0.81 mF/F + 4 pF 0.5 mF/F + 20 pF 0.41 mF/F + 0.2 nF 0.42 mF/F + 2 nF 0.61 mF/F + 20 nF 0.62 mF/F + 0.2 μF 0.71 mF/F + 2 μF 0.71 mF/F + 20 μF	Comparison to Digital Multimeter
Oscilloscopes <sup>1,3</sup> Vertical Gain 50 Ω Load 1 MΩ Load	1 mV to 6.6 V 1 mV to 200 V	0.25 % of reading + 40 μV 0.1 % of reading + 40 μV	Comparison to Fluke 5520A Multiproduct Calibrator
Oscilloscopes <sup>1,3</sup> Bandwidth	5 mV to 3.5 V 50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	2% of reading + 40 μV 3.5 % of reading + 0.3 mV 4 % of reading + 0.3 mV 6 % of reading + 0.3 mV	Comparison to Fluke 5520A Multiproduct Calibrator
Oscilloscopes <sup>1,3</sup> Bandwidth	5 mV to 3.5 V 600 MHz to 1.1 GHz	7 % of reading + 0.3 V	Comparison to Fluke 5520A Multiproduct Calibrator
Oscilloscopes <sup>1,3</sup> Time Base	50 ms to 5 s 20 ms to 2 ns	(25 + 1 000t) ms/s 2.5 μs	Comparison to Fluke 5520A Multiproduct Calibrator

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers <sup>1,2</sup>	Up to 24 in	$(510 + 2.9L) \mu\text{in}$	Comparison to Gage Blocks
Micrometers <sup>1,2</sup>	Up to 24 in	$(37 + 8.8L) \mu\text{in}$	Comparison to Gage Blocks
Plug Gages	(0 to 1) in	34 $\mu\text{in}$	Comparison to Laser Micrometer
Length Measurements	Up to 40 in	$(2.9 + 1.8L) \mu\text{in}$	Comparison to Universal Length Machine, Gage Blocks
Thread Plugs <sup>2</sup> Major Diameter Pitch Diameter	Up to 10 in Up to 10 in	$(81 + 0.36D) \mu\text{in}$ $(83 + 0.35D) \mu\text{in}$	Comparison to Universal Length Machine, Gage Blocks, Thread Wires
Ring Gages <sup>2</sup>	(0.04 to 3) in (3 to 10) in	$(16 + 2.1D) \mu\text{in}$ $(18 + 1.4D) \mu\text{in}$	Comparison to Universal Length Machine, Master Rings
Height Gages <sup>1,2</sup>	Up to 24 in	$(33 + 12L) \mu\text{in}$	Comparison to Gage Blocks, Surface Plate
Squares, Knee Blocks <sup>2</sup>	Up to 18 in	$(88 + 1.8L) \mu\text{in}$	Comparison to Square, Comparator
Indicators <sup>1,5</sup>	Up to 0.4 in	14 $\mu\text{in}$	Comparison to Indicator Calibrator
Indicators <sup>1,2,5</sup>	Up to 4 in	$(27 + 10L) \mu\text{in}$	Comparison to Gage Blocks
Surface Plates <sup>1,2</sup>			In accordance with ASME B89.3.7 using Electronic Level System
Overall Flatness	Up to 161 inDL	0.31 $\mu\text{in/in} + 17 \mu\text{in}$	
Local Area Flatness	$\pm 1\ 000 \mu\text{in}$	14 $\mu\text{in}$	Repeat-O-Meter
Digital Detector Array	(0.011 to 0.5) in	20 $\mu\text{in}$	Customer procedure MP-7604 using Pin Gages measurements supervised by laboratory
Digital Microscopes	Up to 100 $\mu\text{m}$ (100 to 10 000) $\mu\text{m}$	1.2 $\mu\text{m}$ 3 $\mu\text{m}$	Customer procedure MP-7598 using a Glass Scale measurements supervised by laboratory

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Imaging Dimension Measurement System – Outside Diameter	0.1 in	20 µin	Customer procedure MP-7599 using pin gage measurements supervised by laboratory
Imaging Dimension Measurement System – Inside Diameter	0.8 in	19 µin	Customer procedure MP-7599 using ring gage measurements supervised by laboratory
Imaging Dimension Measurement System – Height	0.1 in 0.2 in	4.3 µin 4.3 µin	Customer procedure MP-7599 using gage blocks measurements supervised by laboratory
Scanning Electron Microscope	2 µm 50 µm 500 µm	0.047 µm 0.25 µm 0.26 µm	Customer procedure MP-7600 using a Magnification Reference Standard measurement supervised by laboratory

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Devices <sup>5</sup>	(5 to 400) inH <sub>2</sub> O	0.009 % of reading	Comparison to Deadweight Tester
Pressure Devices <sup>5</sup>	Up to 200 psi	0.051 % of reading + 0.002 9 psi	Comparison to Pressure Controller/Calibrator
Pressure Devices <sup>5</sup>	(10 to 10 000) psi	0.056 % of reading	Comparison to Deadweight Tester
Vacuum Devices	(> 0 to 30) inHg	0.007 6 % of reading + 0.000 73 psi	Comparison to Pressure Controller/Calibrator
Torque Tools, Torque Wrenches	(4 to 50) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft (200 to 2 000) lbf·ft	0.29 % of reading 0.29 % of reading 0.29 % of reading 0.29 % of reading 0.29 % of reading 0.29 % of reading	Comparison to Torque Calibrator, Torque Transducers

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Calibrators, Torque Transducers	(4 to 50) lbf-in (30 to 400) lbf-in (400 to 1 000) lbf-in (50 to 2 000) lbf-ft	0.05 % of reading 0.05 % of reading 0.05 % of reading 0.049 % of reading	Comparison to Torque Arm, Masses
Balances and Scales <sup>1,4</sup> (SI)	(> 0 to 10 000) g	0.000 33 % of reading + 54 µg	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
Balances and Scales <sup>1,4</sup> (SI)	(> 0 to 10 000) g	0.012 % of reading + 13 mg	NIST Class F weights and internal calibration procedure utilized for the calibration of the weighing system.
Balances and Scales <sup>1,4</sup> (Avoirdupois)	(> 0 to 30) lb (50 to 1 250) lb	0.006 lb 0.012 % of reading	NIST Class F weights and internal calibration procedure utilized for the calibration of the weighing system.
Force Gages (Tension only)	Up to 1 250 lbf	0.013 % of reading + 0.000 21 lbf	Comparison to NIST Class F weights

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure <sup>1</sup>	(0 to 90) %RH (90 to 100) %RH	1.4 %RH 2.1 %RH	Comparison to Vaisala Humidity and Temperature Meter
Temperature – Measure <sup>1</sup>	(0 to 50) °C	0.33 °C	Comparison to Vaisala Humidity and Temperature Meter
Ovens, Temperature Chambers, Furnaces, Freezers, etc. <sup>1</sup>	(-200 to 0) °C (0 to 600) °C	0.029 °C 0.015 % of reading + 0.021 °C	Comparison to Temperature Indicator with PRT
Temperature Sensors; Systems that utilize Thermocouples, Thermistors, RTD's, Bimetallic, and Expanding Reservoir Type Probes <sup>1</sup>	(-30 to 125) °C	0.053 % of reading + 0.088 °C	Comparison to Micro-bath monitored with Temperature Indicator with PRT

### Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature Sensors; Systems that utilize Thermocouples, Thermistors, RTD's, Bimetallic, and Expanding Reservoir Type Probes <sup>1</sup>	(50 to 650) °C	0.084 % of reading + 0.034 °C	Comparison to Drywell monitored with Temperature Indicator with PRT
Thermocouples	(50 to 500) °C	0.036 % of reading + 0.78 °C	Comparison to Drywell monitored with Temperature Indicator with PRT, Fluke 754
Temperature System Accuracy Test <sup>1</sup>	Type J (0 to 450) °F Type N (0 to 1 200) °F (1 200 to 2 100) °F Type T (-40 to 220) °F	3.1 °F 5.9 °F 5.7 °F 2.2 °F	In accordance with AMS 2750G and Boeing 5621M.
Temperature Uniformity Test <sup>1</sup>	Type J (0 to 450) °F Type N (0 to 1 200) °F (1 200 to 2 100) °F Type T (-40 to 220) °F	3.1 °F 5.9 °F 5.7 °F 2.2 °F	In accordance with AMS 2750G and Boeing 5621M.

### Time and Frequency

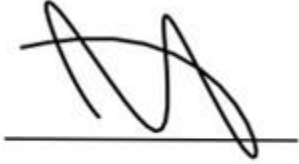
Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Timers, Chart Recorders <sup>1</sup>	Up to 2 hr	0.12 s	Comparison to Stopwatch

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:

- 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.
- $L$  = length in inches;  $DL$  = diagonal length in inches;  $t$  = time in seconds;  $D$  = diameter in inches.
- Uncertainties for Electromagnetic – DC/Low Frequency do not include contributions from a “best existing” unit under test and as such, reported uncertainties will always be larger than those expressed on the scope of accreditation.
- The uncertainties for scales and balances are highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of a unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
- Resolution will be added at the time of calibration using the following formula:  $0.6R$ , where  $R$  = resolution of the unit under test.

- 6. Unless otherwise specified in the far-right column, the calibration procedure or method was developed internally.
- 7. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2048.



Jason Stine, Vice President

