



**LABORATORY  
ACCREDITATION  
BUREAU** a division of A-S-B

# Certificate of Accreditation

**ISO/IEC 17025:2005**

**Certificate Number L2216.01**

## **Calibration Laboratory, LLC**

3695 N. 126<sup>th</sup> Street  
Brookfield WI 53005

has met the requirements set forth in L-A-B's policies and procedures, all requirements of ANSI Z540-1, ANSI/NCSL Z540.3 & ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories".\*

The accredited lab has demonstrated technical competence to a defined "Scope of Accreditation" and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Accreditation valid through: February 15, 2019

**R. Douglas Leonard, Jr., President, COO  
Laboratory Accreditation Bureau  
Presented the 15<sup>th</sup> of February 2017**

\*See the laboratory's Scope of Accreditation for details of accredited parameters

\*\*Laboratory Accreditation Bureau is found to be in compliance with ISO/IEC 17011:2004 and recognized by ILAC (International Laboratory Accreditation Cooperation) and NACLA (National Cooperation for Laboratory Accreditation).  
Form 28.1 - Rev 1 7/3/13

# Scope of Accreditation

## For

### Calibration Laboratory, LLC

3695 N. 126th Street  
Brookfield, WI 53005  
Jeff Breidigan  
708-596-5800

In recognition of a successful assessment to ISO/IEC 17025:2005, ANSI/NCSL Z540.1:1994 (R2002) and ANSI/NCSL Z540.3:2006, accreditation is granted to **Calibration Laboratory, LLC** to perform the following **Calibrations**:

Accreditation granted through: **February 15, 2019**

## Calibration

### Electrical -Capacitance

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Capacitance – Source	(0.19 to 0.4) nF	0.005 nF / nF + 0.01 nF	Fluke 5520A/SC1100
	(0.4 to 1.1) nF	0.005 nF / nF + 0.01 nF	
	(1.1 to 3.3) nF	0.005 nF / nF + 0.01 nF	
	(3.3 to 11) nF	0.002 nF / nF + 0.1 nF	
	(11 to 33) nF	0.002 nF / nF + 0.1 nF	
	(33 to 110) nF	0.003 nF / nF + 0.088 nF	
	(110 to 330) nF	0.002 nF / nF + 0.3 nF	
	(0.33 to 1.1) μF	0.003 μF / μF + 0.98 nF	
	(1.1 to 3.3) μF	0.003 μF / μF + 3 nF	
	(3.3 to 11) μF	0.003 μF / μF + 10 nF	
	(11 to 33) μF	0.004 μF / μF + 30 nF	
	(33 to 110) μF	0.005 μF / μF + 0.1 μF	
	(110 to 330) μF	0.005 μF / μF + 0.3 μF	
	(0.33 to 1.1) mF	0.005 μF / μF + 1 μF	
	(1.1 mF to 3.3) mF	0.9 mF / mF + 57 μF	
(3.3 to 11) mF	3 μF / mF + 55 μF		
(11 to 33) mF	7 μF / mF + 48 μF		
(33 to 110) mF	10 μF / mF + 0.1 mF		

### Electrical -Current

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
AC Current - Source	(22 to 220) uA		Fluke 5520A/SC1100
	(10 to 20) Hz	0.7 nA/A + 25 nA	
	(20 to 40) Hz	0.36 nA/A + 20 nA	
	40 Hz to 1 kHz	0.14 nA/A + 16 nA	
	(1 to 5) kHz	0.6 nA/A + 40 nA	
(5 to 10) kHz	1.6 nA/A + 80 nA		

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
AC Current - Source	(0.22 to 2.2) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.7 nA/μA + 41 nA 0.35 nA/μA + 37 nA 0.14 nA/μA + 39 nA 0.6 nA/μA + 40 nA 1.6 nA/μA + 80 nA	Fluke 5520A/SC1100
AC Current - Source	(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	0.7 nA/μA + 0.4 μA 0.35 nA/μA + 0.35 μA 0.17 nA/μA + 0.3 μA 0.6 nA/μA + 4 μA 1.6 nA/μA + 8 μA	Fluke 5520A/SC1100
AC Current - Source	(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	0.7 nA/μA + 4.1 μA 0.38 nA/μA + 2.8 μA 0.14 nA/μA + 3.8 μA 0.6 nA/μA + 40 μA 1.6 nA/μA + 80 μA	Fluke 5520A/SC1100
AC Current - Source	(0.22 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.35 nA/μA + 36 μA 0.75 nA/μA + 81 μA 8.5 nA/μA + 160 μA	Fluke 5520A/SC1100
DC Current - Source	(0 to 220) μA	50 μA/A + 8.7 nA	Fluke 5520A/SC1100
	(0.22 to 2.2) mA	50 μA/A + 8.3 nA	
	(2.2 to 22) mA	50 μA/A + 80 nA	
	(22 to 220) mA	69 μA/A + 0.6 μA	
	(0.22 to 2.2) A	0.12 mA/A + 0.24 mA	
DC Current – Source <sup>1</sup>	0 μA to 330 μA	0.14 nA/μA + 27 nA	Fluke 5520A/SC1100
	0.3 mA to 3.3 mA	0.1 μA/μA + 52 nA	
	3.3 mA to 33 mA	0.1 μA/μA + 0.28 μA	
	33 mA to 330 mA	0.1 μA/μA + 2.5 μA	
	0.33 A to 1.1 A	0.2 mA/A + 40 μA	
	1.1 A to 3 A	0.38 mA/A + 40 μA	
	3.0 A to 11 A	0.5 mA/A + 0.5 mA	
	11 A to 20 A	1 mA/A + 0.75 mA	
	(20 to 100) A	0.4 mA / A + 22 mA	Ballantine 1620A Transconductance Amplifier
DC Source – Current Clamps <sup>1</sup>	(10 to 150) A	3.6 mA / A + 1.5 mA	Fluke 5520A/SC1100 with Fluke 50-turn coil
	(150 to 1 025) A	3.4 mA / A + 0.11 A	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
AC Current – Source <sup>1</sup>	(30 to 330) $\mu$ A (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	2 nA/ $\mu$ A + 0.1 $\mu$ A 1.5 nA/ $\mu$ A + 0.1 $\mu$ A 1.2 nA/ $\mu$ A + 0.1 $\mu$ A 3 nA/ $\mu$ A + 0.15 $\mu$ A 8 nA/ $\mu$ A + 0.2 $\mu$ A 16 nA/ $\mu$ A + 0.4 $\mu$ A	Fluke 5520A/SC1100
	(0.33 to 3.3) mA (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	2 $\mu$ A/mA + 0.15 $\mu$ A 1.2 $\mu$ A/mA + 0.15 $\mu$ A 1 $\mu$ A/mA + 0.15 $\mu$ A 2 $\mu$ A/mA + 0.2 $\mu$ A 5 $\mu$ A/mA + 0.3 $\mu$ A 10 $\mu$ A/mA + 0.6 $\mu$ A	Fluke 5520A/SC1100
	(3.3 to 33) mA (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	1.8 $\mu$ A/mA + 2 $\mu$ A 0.9 $\mu$ A/mA + 2 $\mu$ A 0.4 $\mu$ A/mA + 2 $\mu$ A 0.8 $\mu$ A/mA + 2 $\mu$ A 2 $\mu$ A/mA + 3 $\mu$ A 4 $\mu$ A/mA + 4 $\mu$ A	Fluke 5520A/SC1100
	(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 (10 to 30) kHz	1.8 $\mu$ A/mA + 20 $\mu$ A 0.9 $\mu$ A/mA + 20 $\mu$ A 0.4 $\mu$ A/mA + 20 $\mu$ A 1 $\mu$ A/mA + 50 $\mu$ A 2 $\mu$ A/mA + 0.1 mA 4 $\mu$ A/mA + 0.2 mA	Fluke 5520A/SC1100
	(0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.6 $\mu$ A/mA + 0.18 mA 0.44 $\mu$ A/mA + 0.12 mA 5.2 $\mu$ A/mA + 1.3 mA 2.2 $\mu$ A/mA + 0.61 mA	Fluke 5520A/SC1100
	(1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.8 mA/A + 0.1 mA 0.6 mA/A + 0.1 mA 6 mA/A + 1 mA 25 mA/A + 5 mA	Fluke 5520A/SC1100
	(3 to 11) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.6 mA/A + 2 mA 1 mA/A + 2 mA 30 mA/A + 2 mA	Fluke 5520A/SC1100
	(11 to 20) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.2 mA/A + 5 mA 1.5 mA/A + 5 mA 30 mA/A + 5 mA	Fluke 5520A/SC1100
	AC Current – Source <sup>1</sup>	(20 to 100) A 45 Hz to 1 kHz	1.8 mA / A + 0.12 A
AC Current Source – Current Clamps <sup>1</sup>  (45 to 65) Hz	(10 to 16.5) A	0.2 mA / A + 0.3 A	Fluke 5520A/SC1100 with Fluke 50-turn coil
	(16.5 to 150) A	2.7 mA / A + 0.25 A	
	(150 to 1 025) A	3.8 mA / A + 0.15 A	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
AC Current Source – Current Clamps <sup>1</sup>  (65 to 440) Hz	(10 to 16.5) A	0.27 mA / A + 0.28 A	Fluke 5520A/SC1100 with Fluke 50-turn coil
	(16.5 to 150) A	8.7 mA / A + 0.18 A	
	(150 to 1 025) A	9.5 mA / A + 0.14 A	

**Electrical -Inductance**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Inductance – Generate Fixed Points (400 Hz, 1kHz) <sup>1</sup>	100 $\mu$ H	0.12 % of reading	GenRad Standard Inductors
	500 $\mu$ H	0.12 % of reading	
	1 mH	0.12 % of reading	
	10 mH	0.12 % of reading	
	50 mH	0.12 % of reading	
	100 mH	0.12 % of reading	
	200 mH	0.12 % of reading	
	1 H	0.12 % of reading	

**Electrical – Power**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
DC Power <sup>1</sup>	(0 to 336) W	0.04% of output	Fluke 5520A/SC1100
	(336 to 3 060) W	0.054% of output	
	(3 060 to 20 910) W	0.13% of output	
AC Power (45 to 65) Hz <sup>1</sup>	(0.11 to 3) mW	0.14% of output	Fluke 5520A/SC1100
	(3 to 11) mW	0.1% of output	
	(11 to 30) mW	0.16% of output	
	(30 to 110) mW	0.12% of output	
	(110 to 300) mW	0.15% of output	
	(300 to 730) mW	0.13% of output	
	(0.73 to 1.5) W	0.15% of output	
	(1.5 to 6.8) W	0.14% of output	
	(6.8 to 9.2) W	0.14% of output	
	(9.2 to 34) W	0.1% of output	
	(34 to 92) W	0.14% of output	
	(92 to 337) W	0.1% of output	
	(337 to 918) W	0.13% of output	
	(918 to 2 244) W	0.11% of output	
	(2 244 to 4 590) W	0.14% of output	
(4 590 to 11 220) W	0.12% of output		

**Electrical -Resistance**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Resistance – Source <sup>1</sup>	(0 to 11) Ω	40 μΩ / Ω + 1 mΩ	Fluke 5520A/SC1100
	(11 to 33) Ω	30 μΩ / Ω + 1.5 mΩ	
	(33 to 110) Ω	28 μΩ / Ω + 1.4 mΩ	
	(110 to 330) Ω	28 μΩ / Ω + 2.1 mΩ	
	(330 to 1 100) Ω	28 μΩ / Ω + 2 mΩ	
	(1.1 to 3.3) kΩ	28 μΩ / Ω + 200 mΩ	
	(3.3 to 11) kΩ	30 μΩ / Ω + 200 mΩ	
	(11 to 33) kΩ	30 μΩ / Ω + 210 mΩ	
	(33 to 110) kΩ	28 μΩ / Ω + 240 mΩ	
	(110 to 330) kΩ	32 μΩ / Ω + 2 Ω	
	(0.33 to 1.1) MΩ	32 μΩ / Ω + 2 Ω	
	(1.1 to 3.3) MΩ	69 μΩ / Ω + 21 Ω	
	(3.3 to 11) MΩ	130 μΩ / Ω + 50 Ω	
	(11 to 33) MΩ	250 μΩ / Ω + 2.5 kΩ	
(33 to 110) MΩ	0.5 mΩ / Ω + 3 kΩ		
(110 to 330) MΩ	3 mΩ / Ω + 100 kΩ		
(330 to 1 100) MΩ	15 mΩ / Ω + 0.5 MΩ		
Electrical Simulation of RTD Indicating Devices 1	(-200 to -80) °C	0.052 °C	Fluke 5520A/SC1100
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 300) °C	0.091 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 630) °C	0.12 °C	
	(630 to 800) °C	0.23 °C	
Pt 385, 100 Ω	(-200 to -80) °C	0.043 °C	Fluke 5520A/SC1100
	(-80 to 0) °C	0.043 °C	
	(0 to 100) °C	0.043 °C	
	(100 to 260) °C	0.052 °C	
	(260 to 300) °C	0.12 °C	
	(300 to 400) °C	0.13 °C	
	(400 to 600) °C	0.14 °C	
	(600 to 630) °C	0.16 °C	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Pt 385, 500 $\Omega$	(-200 to -80) °C	0.043 °C	Fluke 5520A/SC1100
	(-80 to 0) °C	0.052 °C	
	(0 to 100) °C	0.052 °C	
	(100 to 260) °C	0.062 °C	
	(260 to 300) °C	0.081 °C	
	(300 to 400) °C	0.081 °C	
	(400 to 600) °C	0.091 °C	
	(600 to 630) °C	0.11 °C	
Pt 385, 1000 $\Omega$	(-200 to -80) °C	0.034 °C	Fluke 5520A/SC1100
	(-80 to 0) °C	0.034 °C	
	(0 to 100) °C	0.043 °C	
	(100 to 260) °C	0.052 °C	
	(260 to 300) °C	0.062 °C	
	(300 to 400) °C	0.072 °C	
	(400 to 600) °C	0.072 °C	
	(600 to 630) °C	0.23 °C	
Pt 3916, 100 $\Omega$	(-200 to -190) °C	0.25 °C	Fluke 5520A/SC1100
	(-190 to -80) °C	0.043 °C	
	(-80 to 0) °C	0.053 °C	
	(0 to 100) °C	0.062 °C	
	(100 to 260) °C	0.072 °C	
	(260 to 300) °C	0.082 °C	
	(300 to 400) °C	0.092 °C	
	(400 to 600) °C	0.1 °C	
	(600 to 630) °C	0.23 °C	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Pt 3926, 100 $\Omega$	(-200 to -80) $^{\circ}\text{C}$	0.053 $^{\circ}\text{C}$	Fluke 5520A/SC1100
	(-80 to 0) $^{\circ}\text{C}$	0.053 $^{\circ}\text{C}$	
	(0 to 100) $^{\circ}\text{C}$	0.072 $^{\circ}\text{C}$	
	(100 to 300) $^{\circ}\text{C}$	0.092 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$	
	(400 to 630) $^{\circ}\text{C}$	0.12 $^{\circ}\text{C}$	
PtNi 385, 120 $\Omega$	(-80 to 0) $^{\circ}\text{C}$	0.083 $^{\circ}\text{C}$	Fluke 5520A/SC1100
	(0 to 100) $^{\circ}\text{C}$	0.083 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.14 $^{\circ}\text{C}$	
Cu 427, 10 $\Omega$	(-100 to 260) $^{\circ}\text{C}$	0.3 $^{\circ}\text{C}$	Fluke 5520A/SC1100

**Electrical - Voltage**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
DC Voltage - Source <sup>1</sup>	(0 to 330) mV	0.018 $\mu\text{V}/\text{mV} + 2.1 \text{ V}$	Fluke 5520A/SC1100
	(0.3 to 3.3) V	10.6 $\mu\text{V}/\text{V} + 3.8 \mu\text{V}$	
	(3.3 to 33) V	12 $\mu\text{V}/\text{V} + 35 \mu\text{V}$	
	(33 to 330) V	18 $\mu\text{V}/\text{V} + 260 \mu\text{V}$	
	(330 to 1 000) V	18 mV/V + 1.5 mV	
DC Voltage - Source <sup>1</sup>	(1 to 10) kV	0.58 kV + 0.005% of reading	Hipotronics KVM 100
	(10 to 100) kV	0.082 kV + 0.001% of reading	
AC Voltage - Source <sup>1</sup>	(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	0.8 $\mu\text{V}/\text{mV} + 6 \mu\text{V}$ 0.15 $\mu\text{V}/\text{mV} + 6.3 \mu\text{V}$ 0.2 $\mu\text{V}/\text{mV} + 6.3 \mu\text{V}$ 1 $\mu\text{V}/\text{mV} + 6.2 \mu\text{V}$ 3.5 $\mu\text{V}/\text{mV} + 12 \mu\text{V}$ 8 $\mu\text{V}/\text{mV} + 50 \mu\text{V}$	Fluke 5520A/SC1100



Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
AC Volts, Source <sup>1</sup>	(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	0.3 $\mu$ V/mV + 8.1 $\mu$ V 0.15 $\mu$ V/mV + 8.1 $\mu$ V 0.16 $\mu$ V/mV + 8.1 $\mu$ V 0.35 $\mu$ V/mV + 8.1 $\mu$ V 0.8 $\mu$ V/mV + 32 $\mu$ V 2 $\mu$ V/mV + 70 $\mu$ V	Fluke 5520A/SC1100
AC Voltage - Source <sup>1</sup>	(0.33 to 3.3) V (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	300 $\mu$ V/V + 50 $\mu$ V 150 $\mu$ V/V + 60 $\mu$ V 190 $\mu$ V/V + 60 $\mu$ V 300 $\mu$ V/V + 50 $\mu$ V 700 $\mu$ V/V + 130 $\mu$ V 2.4 mV/V + 0.6 mV	Fluke 5520A/SC1100
AC Voltage - Source <sup>1</sup>	(3.3 to 33) V (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.3 mV/V + 0.65 mV 0.3 mV/V + 0.65 mV 0.24 mV/V + 0.6 mV 0.35 mV/V + 0.6 mV 0.9 mV/V + 1.6 mV	Fluke 5520A/SC1100
AC Voltage - Source <sup>1</sup>	(33 to 330) V 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.19 mV/V + 2 mV 0.2 mV/V + 6 mV 0.25 mV/V + 6 mV 0.3 mV/V + 6 mV 2 mV/V + 50 mV	Fluke 5520A/SC1100
AC Voltage - Source <sup>1</sup>	(330 to 1 000) V (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.3 mV/V + 10 mV 0.25 mV/V + 10 mV 0.3 mV/V + 10 mV	Fluke 5520A/SC1100
DC Voltage – Measure <sup>1</sup>	(1 to 100) kV	5 V / kV + 2 V	Hipotronics KVM 100
	(20 to 200) kV	5 V / kV + 20 V	Hipotronics KVM 200
AC Voltage – Measure	(1 to 10) kV @ 60Hz	10 mV / V + 17 mV	Ross Divider & Keithley 2000
AC Voltage – Measure <sup>1</sup>	(1 to 100) kV	5 V / kV + 2 V	KVM 100
	(20 to 200) kV	5 V / kV + 20 V	KVM 200
Electrical Simulation of Thermocouple Indicating Devices 1  Type B	(600 to 800) °C	0.44 °C	Fluke 5520A/SC1100
	(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	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Electrical Simulation of Thermocouple Indicating Devices 1 Type C	(0 to 150) °C	0.3 °C	Fluke 5520A/SC1100
	(150 to 650) °C	0.26 °C	
	(650 to 1 000) °C	0.31 °C	
	(1 000 to 1 800) °C	0.5 °C	
	(1 800 to 2 316) °C	0.84 °C	
Electrical Simulation of Thermocouple Indicating Devices 1 Type E	(-250 to -100) °C	0.5 °C	Fluke 5520A/SC1100
	(-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	
Electrical Simulation of Thermocouple Indicating Devices 1 Type J	(-210 to -100) °C	0.27 °C	Fluke 5520A/SC1100
	(-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	
Electrical Simulation of Thermocouple Indicating Devices 1 Type K	(-200 to -100) °C	0.33 °C	Fluke 5520A/SC1100
	(-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	
Electrical Simulation of Thermocouple Indicating Devices 1 Type N	(-200 to -100) °C	0.4 °C	Fluke 5520A/SC1100
	(-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	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Electrical Simulation of Thermocouple Indicating Devices 1 Type R	(0 to 250) °C	0.57 °C	Fluke 5520A/SC1100
	(250 to 400) °C	0.57 °C	
	(400 to 1 000) °C	0.33 °C	
	(1 000 to 1 767) °C	0.4 °C	
Electrical Simulation of Thermocouple Indicating Devices 1 Type S	(0 to 250) °C	0.47 °C	Fluke 5520A/SC1100
	(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	
Electrical Simulation of Thermocouple Indicating Devices 1 Type T	(-250 to -150) °C	0.63 °C	Fluke 5520A/SC1100
	(-150 to 0) °C	0.24 °C	
	(0 to 120) °C	0.16 °C	
	(120 to 400) °C	0.14 °C	

**Mass – Pressure/Low Vacuum**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Pressure – Measure & Generate <sup>1</sup>	(0 to 15) psi	0.01 psig	Pressure Transducers
	(-15 to 30) psi	0.026 psig	
	(0 to 100) psi	0.06 psig	
	(0 to 500) psi	0.3 psig	
	(0 to 1 000) psi	0.66 psig	
	(0 to 10 000) psi	10 psig	
Vacuum – Measure & Generate <sup>1</sup>	(-14 to 0) psi	0.013 psig	Pressure Transducer

**Thermodynamics – Humidity**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Humidity – Measure <sup>1,3</sup>	(10 to 80) %RH	1.4 %RH	Thermo-hygrometer

**Thermodynamics – Thermodynamic Sources**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Temperature Generate <sup>1,2</sup>	(33° to 300) °C	0.35°C + 0.003 °C / °C	Dry-well & RTD

**Time and Frequency – Frequency / Period**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Frequency – Measure	10 Hz to 1.3 GHz	6.9 parts in 10 <sup>11</sup>	Counter & Rubidium Oscillator
Frequency Measuring Equipment	10 MHz	2.3 parts in 10 <sup>11</sup>	Rubidium Oscillator
Tachometers <sup>1</sup> (Non-Contact Type)	(25 to 90 000) rpm	0.29 rpm + 3 µrpm / rpm	Frequency Counter
Stopwatches & Timers	Up to 24 hr	0.058 s/day	Universal Counter

**Time and Frequency – Oscilloscopes**

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Amplitude – Square Wave (peak to peak) <sup>1</sup> 50 Ω	(1 mV to 6.6 V)	2.5 µV / V + 0.04 µV	Fluke 5520A/SC1100
1 MΩ (1 mV to 130 Vpp)	(0.01 to 1) kHz	1 µV / V + 0.04 µV	
	(1 to 10) kHz	2.5 µV / V + 0.04 µV	
Leveled Sine Wave Amplitude <sup>1</sup> (@ 50 kHz ref.)	50 kHz to 100 MHz	20 µV / V + 0.33 µV	Fluke 5520A/SC1100
	(100 to 300) MHz	40 µV / V + 0.31 µV	
	(300 to 600) MHz	60 µV / V + 0.31 µV	
	(600 to 1 100) MHz	70 µV / V + 0.3 µV	
Flatness <sup>1</sup> (@ 50 kHz ref.)	50 kHz to 100 MHz	15 µV / V + 0.1 µV	Fluke 5520A/SC1100
	(100 to 300) MHz	20 µV / V + 0.1 µV	
	(300 to 600) MHz	40 µV / V + 0.1 µV	
	(600 to 1 050) MHz	50 µV / V + 0.1 µV	

Calibration Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Remarks
Time Marker <sup>1</sup>	1 ns to 20 ms	5 ps / $\mu$ s	Fluke 5520A/SC1100
	50 ms	75 $\mu$ s	
	0.1 s	0.13 $\mu$ s	
	0.2 s	0.23 ms	
	0.5 s	0.53 ms	
	1 s	1 ms	
	2 s	2 ms	
	5 s	5 ms	
Rise Time – Voltage <sup>1</sup>	5 mV to 2.5 V	321 ps	Fluke 5520A/SC1100

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and remarks. 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) Laboratory offers calibration services at the laboratory's own facilities and at the client or other agreed upon facilities.
- 2) Includes Liquid-in-Glass Thermometers, RTDs, Thermocouples, Bi-metallic Thermometers, etc.
- 3) Includes calibration of Relative Humidity instruments in an aqueous salt solution chamber.

Approved by:   
R. Douglas Leonard  
Chief Technical Officer

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