



# CERTIFICATE OF ACCREDITATION

## ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

### **Caltronix, Inc.**

**100 Town Centre Drive**

**Rochester, NY 14623**

**(and satellite location as listed on the scope)**

has been assessed by ANAB

and meets the requirements of international standard

## **ISO/IEC 17025:2005**

and national standard

## **ANSI/NCSL Z540-1-1994 (R2002)**

while demonstrating technical competence in the field of

## **CALIBRATION**

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

AC-1183

Certificate Number

  
ANAB Approval

Certificate Valid: 02/08/2018-01/14/2020

Version No. 004 Issued: 02/08/2018



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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 17025:2005  
AND ANSI/NCSL Z540-1-1994 (R2002)**

**Caltronix, Inc.**

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**CALIBRATION**

Valid to: **January 14, 2020**

Certificate Number: **AC-1183**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage - Measure <sup>1</sup>	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V 100 V to 1 kV	12 $\mu$ V/V + 0.3 $\mu$ V 12 $\mu$ V/V + 0.3 $\mu$ V 12 $\mu$ V/V + 0.5 $\mu$ V 12 $\mu$ V/V + 30 $\mu$ V 12 $\mu$ V/V + 0.1 mV	HP 3458A Opt 002 Digital Multimeter
	(1 to 20) kV (20 to 70) kV	1.4 mV/V + 0.6 V 12 mV/V + 6 V	Vitrek 4670A High Voltage Meter
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 V to 1.1 kV	9.9 $\mu$ V/V + 0.4 $\mu$ V 6.4 $\mu$ V/V + 0.7 $\mu$ V 4.8 $\mu$ V/V + 2.5 $\mu$ V 4.8 $\mu$ V/V + 4 $\mu$ V 6.4 $\mu$ V/V + 40 $\mu$ V 8 $\mu$ V/V + 0.4 mV	Fluke 5720A Multifunction Calibrator
DC Current - Measure <sup>1</sup>	Up to 100 nA 100 nA to 1 $\mu$ A (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	47 $\mu$ A/A + 40 pA 31 $\mu$ A/A + 40 pA 31 $\mu$ A/A + 0.1 nA 29 $\mu$ A/A + 0.8 nA 29 $\mu$ A/A + 5 nA 29 $\mu$ A/A + 50 nA 47 $\mu$ A/A + 0.5 $\mu$ A 0.14 mA/A + 10 $\mu$ A	HP 3458A Opt 002 Digital Multimeter



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	47 $\mu$ A/A + 6 nA 41 $\mu$ A/A + 7 nA 41 $\mu$ A/A + 40 nA 52 $\mu$ A/A + 0.7 $\mu$ A 93 $\mu$ A/A + 12 $\mu$ A	Fluke 5720A Multifunction Calibrator
	(2.2 to 11) A	0.42 mA/A + 0.48 mA	Fluke 5725A Amplifier
	(11 to 20.5) A	1.2 mA/A + 0.75 mA	Fluke 5520A Multifunction Calibrator
DC Current Clamp Non-Toroidal –Source	(20 to 150) A (150 to 1 000) A	0.72 % of reading + 0.14 A 2 % of reading + 0.5 A	Fluke 5500A Coil w/Fluke 5520A Multifunction Calibrator
AC Voltage - Measure <sup>1</sup>	(1 to 10) mV (1 to 40) Hz	0.35 mV/V + 3 $\mu$ V	HP 3458A Opt 002 Digital Multimeter
	40 Hz to 1 kHz	0.24 mV/V + 1.1 $\mu$ V	
	(1 to 20) kHz	0.36 mV/V + 1.1 $\mu$ V	
	(20 to 50) kHz	1.2 mV/V + 1.1 $\mu$ V	
	(50 to 100) kHz	5.8 mV/V + 1.1 $\mu$ V	
	(100 to 300) kHz	46 mV/V + 2 $\mu$ V	
	300 kHz to 1 MHz	15 mV/V + 5 $\mu$ V	
	(10 to 100) mV (1 to 40) Hz	89 $\mu$ V/V + 4 $\mu$ V	
	40 Hz to 1kHz	86 $\mu$ V/V + 2 $\mu$ V	
	(1 to 20) kHz	0.17 mV/V + 2 $\mu$ V	
	(20 to 50) kHz	0.36 mV/V + 2 $\mu$ V	
	(50 to 100) kHz	0.93 mV/V + 2 $\mu$ V	
	(100 to 300) kHz	3.5 mV/V + 10 $\mu$ V	
	300 kHz to 1 MHz	12 mV/V + 10 $\mu$ V	
	(1 to 2) MHz	18 mV/V + 10 $\mu$ V	
(2 to 4) MHz	46 mV/V + 70 $\mu$ V		
(4 to 8) MHz	47 mV/V + 80 $\mu$ V		
(8 to 10) MHz	0.18 V/V + 0.1 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure <sup>1</sup>	100 mV to 1 V		HP 3458A Opt 002 Digital Multimeter
	(1 to 40) Hz	89 $\mu$ V/V + 40 $\mu$ V	
	40 Hz to 1kHz	82 $\mu$ V/V + 20 $\mu$ V	
	(1 to 20) kHz	0.16 mV/V + 20 $\mu$ V	
	(20 to 50) kHz	0.35 mV/V + 20 $\mu$ V	
	(50 to 100) kHz	0.93 mV/V + 20 $\mu$ V	
	(100 to 300) kHz	3.5 mV/V + 0.1 mV	
	300 kHz to 1 MHz	12 mV/V + 0.1 mV	
	(1 to 2) MHz	18 mV/V + 0.1 mV	
	(2 to 4) MHz	46 mV/V + 0.7 mV	
	(4 to 8) MHz	47 mV/V + 0.8 mV	
	(8 to 10) MHz	0.18 V/V + 1 mV	
	(1 to 10) V		
	(1 to 40) Hz	89 $\mu$ V/V + 0.4 mV	
	40 Hz to 1kHz	82 $\mu$ V/V + 0.2 mV	
	(1 to 20) kHz	0.16 mV/V + 0.2 mV	
	(20 to 50) kHz	0.35 mV/V + 0.2 mV	
	(50 to 100) kHz	0.93 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	18 mV/V + 1 mV	
	(2 to 4) MHz	46 mV/V + 7 mV	
	(4 to 8) MHz	46 mV/V + 8 mV	
	(8 to 10) MHz	0.18 V/V + 10 mV	
	(10 to 100) V		
	(1 to 40) Hz	0.24 mV/V + 4 mV	
	40 Hz to 1 kHz	0.23 mV/V + 2 mV	
	(1 to 20) kHz	0.23 mV/V + 2 mV	
	(20 to 50) kHz	0.41 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	18 mV/V + 10 mV		
100 V to 700 V			
(1 to 40) Hz	0.47 mV/V + 40 mV		
40 Hz to 1 kHz	0.46 mV/V + 20 mV		
(1 to 20) kHz	0.69 mV/V + 20 mV		
(20 to 50) kHz	1.4 mV/V + 20 mV		
(50 to 100) kHz	3.5 mV/V + 20 mV		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage - Measure <sup>1</sup>	(1.1 to 20) kV (20 to 100) Hz (20 to 70) kV (50 to 60) Hz	5.2 mV/V + 0.6 mV  13 mV/V + 6 V	Vitrek 4670A High Voltage Meter
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 (2.2 to 22) 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 (22 to 220) 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 220 mV to 2.2 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	0.28 mV/V + 4 μV 0.11 mV/V + 4 μV 93 μV/V + 4 μV 0.23 mV/V + 4 μV 0.58 mV/V + 5 μV 1.2 mV/V + 10 μV 1.6 mV/V + 20 μV 3.1 mV/V + 20 μV  0.28 mV/V + 4 μV 0.11 mV/V + 4 μV 93 μV/V + 4 μV 0.23 mV/V + 4 μV 0.58 mV/V + 5 μV 1.2 mV/V + 10 μV 1.6 mV/V + 20 μV 3.1 mV/V + 20 μV  0.28 mV/V + 12 μV 0.11 mV/V + 7 μV 93 μV/V + 7 μV 0.23 mV/V + 7 μV 0.53 mV/V + 17 μV 1.1 mV/V + 20 μV 1.6 mV/V + 25 μV 3.1 mV/V + 45 μV  0.33 mV/V + 40 μV 0.11 mV/V + 15 μV 66 μV/V + 8 μV 0.11 mV/V + 10 μV 0.15 mV/V + 30 μV 0.53 mV/V + 80 μV 1.2 mV/V + 0.2 mV 2.0 mV/V + 0.3 mV	Fluke 5720A Multifunction Calibrator



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) V		Fluke 5720A Multifunction Calibrator
	(10 to 20) Hz	0.29 mV/V + 0.40 mV	
	(20 to 40) Hz	0.11 mV/V + 0.15 mV	
	40 Hz to 20 kHz	66 μV/V + 50 μV	
	(20 to 50) kHz	0.11 mV/V + 0.1 mV	
	(50 to 100) kHz	0.14 mV/V + 0.2 mV	
	(100 to 300) kHz	0.38 mV/V + 0.6 mV	
	(300 to 500) kHz	1.2 mV/V + 2 mV	
	500 kHz to 1 MHz	1.9 mV/V + 3.2 mV	
	(22 to 220) V		
	(10 to 20) Hz	0.29 mV/V + 4 mV	
	(20 to 40) Hz	0.11 mV/V + 1.5 mV	
	40 Hz to 20 kHz	72 μV/V + 0.6 mV	
	(20 to 50) kHz	0.13 mV/V + 1 mV	
(50 to 100) kHz	0.21 mV/V + 2.5 mV		
(100 to 300) kHz	1.1 mV/V + 16 mV		
(300 to 500) kHz	5.1 mV/V + 40 mV		
500 kHz to 1 MHz	9.3 mV/V + 80 mV		
AC Voltage - Measure <sup>1</sup>	220 V to 1.1 kV		Fluke 5720A Multifunction Calibrator with Fluke 5725A Amplifier
	(15 to 50) Hz	0.35 mV/V + 16 mV	
	50 Hz to 1 kHz	86 μV/V + 3.5 mV	
	40 Hz to 1 kHz	0.11 mV/V + 4 mV	
	(1 to 20) kHz	0.19 mV/V + 6 mV	
	(20 to 30) kHz	0.7 mV/V + 11 mV	
	750 V		
(30 to 50) kHz	0.7 mV/V + 11 mV		
(50 to 100) kHz	2.7 mV/V + 45 mV		
AC Current - Measure <sup>1</sup>	Up to 100 μA		HP 3458A Opt 002 Digital Multimeter
	(10 to 20) Hz	4.6 mA/A + 30 nA	
	(20 to 45) Hz	1.8 mA/A + 30 nA	
	(45 to 100) Hz	0.7 mA/A + 30 nA	
	100 Hz to 1 kHz	0.7 mA/A + 30 nA	
	(1 to 100) mA		
	(10 to 20) Hz	4.6 mA/A + 20 μA	
	(20 to 45) Hz	1.8 mA/A + 20 μA	
	(45 to 100) Hz	0.7 mA/A + 20 μA	
	100 Hz to 5 kHz	0.36 mA/A + 20 μA	





Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
AC Current - Measure <sup>1</sup>	100 mA to 1 A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	4.6 mA/A + 0.2 mA 1.9 mA/A + 0.2 mA 0.93 mA/A + 0.2 mA 1.2 mA/A + 0.2 mA	HP 3458A Opt 002 Digital Multimeter	
AC Current – Source <sup>1</sup>	Up to 220 $\mu$ A (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.33 mA/A + 16 nA 0.22 mA/A + 10 nA 0.17 mA/A + 8 nA 0.46 mA/A + 12 nA 1.4 mA/A + 65 nA	Fluke 5720A Multifunction Calibrator	
	220 $\mu$ A 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	0.33 mA/A + 40 nA 0.21 mA/A + 35 nA 0.17 mA/A + 35 nA 0.27 mA/A + 0.11 $\mu$ A 1.3 mA/A + 0.65 $\mu$ A		
	(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	0.38 mA/A + 0.4 $\mu$ A 0.22 mA/A + 0.35 $\mu$ A 0.17 mA/A + 0.35 $\mu$ A 0.27 mA/A + 0.55 $\mu$ A 1.3 mA/A + 5 $\mu$ A		
	(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	0.38 mA/A + 4 $\mu$ A 0.22 mA/A + 3.5 $\mu$ A 0.17 mA/A + 2.5 $\mu$ A 0.27 mA/A + 3.5 $\mu$ A 1.4 mA/A + 10 $\mu$ A		
	220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.33 mA/A + 35 $\mu$ A 0.54 mA/A + 80 $\mu$ A 8.2 mA/A + 0.16 mA		
	2.2A to 11 A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.54 mA/A + 0.17 mA 1.1 mA/A + 0.38 mA 4.2 mA/A + 0.75 mA		Fluke 5725A Amplifier



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source <sup>1</sup>	11A to 20.5 A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.5 mA/A + 5 mA 1.8 mA/A + 5 mA 35 mA/A + 5 mA	Fluke 5520A Multifunction Calibrator
AC Current Clamp Non Toroidal- Source	(20 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 000) A (45 to 65) Hz (65z to 440) Hz	0.72 % of reading + 0.25 A 1.2 % of reading + 0.25A 1.3 % of reading + 0.9 A 1.8 % of reading + 0.9 A	Fluke 5500A Coil w/Fluke 5520A Multifunction Calibrator
AC Current Clamp Toroidal- Source	(20 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 000) A (45 to 65) Hz (65 to 440) Hz	0.46 % of reading + 0.025 A 0.98 % of reading + 0.027A 1.1 % of reading + 0.09 A 1.7 % of reading + 0.1 A	
Resistance – Source <sup>1</sup>	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	48 μΩ 0.12 mΩ/Ω 0.12 mΩ/Ω 28 μΩ/Ω 31 μΩ/Ω 12 μΩ/Ω 13 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 13 μΩ/Ω 15 μΩ/Ω 24 μΩ/Ω 26 μΩ/Ω 48 μΩ/Ω 65 μΩ/Ω 0.13 mΩ/Ω	Fluke 5720A Multifunction Calibrator





Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance - Source <sup>1</sup> Fixed Values	10 mΩ 100 mΩ 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ	12 μΩ/Ω + 0.1 nΩ 12 μΩ/Ω 12 μΩ/Ω 12 μΩ/Ω 12 μΩ/Ω 12 μΩ/Ω 12 μΩ/Ω 23 μΩ/Ω 0.12 mΩ/Ω	L&N 4222 Resistor L&N 4015-B Resistor L&N 4020-B Resistor L&N 8070/10 Resistor L&N 100 Resistor Gray 1000 Resistor Gray 10000 Resistor L&N 4045-B Resistor ESI SR-1 Resistor
Resistance - Measure <sup>1</sup>	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	23 μΩ/Ω + 0.1 mΩ 23 μΩ/Ω + 1 mΩ 18 μΩ/Ω + 1 mΩ 18 μΩ/Ω + 10 mΩ 18 μΩ/Ω + 0.1 Ω 23 μΩ/Ω + 4 Ω 87 μΩ/Ω + 0.1 kΩ 1.2 mΩ/Ω + 1 kΩ 12 mΩ/Ω + 10 kΩ	HP 3458A Opt 002 Digital Multimeter
Capacitance - Measure	0.01 pF to 10 μF	0.3 mF/F	General Radio 1689M RLC Bridge
Capacitance - Source <sup>1</sup>	(10 to 1k) Hz 190 pF to 3.3 nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF (10 to 600) Hz 330 nF to 1.1 μF (10 to 300) Hz (1.1 to 3.3) μF (10 to 150) Hz (3.3 to 11) μF (10 to 120) Hz (11 to 33) μF	6.7 mF/F + 10 pF 3 mF/F + 10 pF 3 mF/F + 0.1 nF 3.4 mF/F + 0.3 nF 3 mF/F + 1 nF 3.5 mF/F + 3 nF 3.1 mF/F + 10 nF 5.2 mF/F + 30 nF	Fluke 5520A/SC600 Multifunction Calibrator
	@ 1 kHz 100 pF 1 nF	0.002 4 pF 0.024 pF	Capacitors General Radio 1404-B General Radio 1404-A
Inductance - Measure	100 μH to 10 H	0.3 mH/H	General Radio 1689M



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Inductance - Source <sup>1</sup> Fixed Points @ 100 Hz and 1 kHz	100 $\mu$ H 1 mH 10 mH 100 mH 1 H	0.31 $\mu$ H 1.2 $\mu$ H 16 $\mu$ H 0.12 mH 1.3 mH	General Radio 1482B General Radio 1482E General Radio 1482H General Radio 1482L General Radio 1482P
Phase Angle - Source <sup>1</sup> 500 mV to 3 V	(0 to 90) ° 65 Hz 400 Hz 1 kHz 10 kHz 30 kHz	0.26 ° 0.37 ° 0.63 ° 5.8 ° 12 °	Fluke 5520A/SC600 Multifunction Calibrator
Oscilloscopes <sup>1</sup> Leveled Sine Wave 50 kHz reference  (50 kHz reference)  10 Hz to 100 kHz into 1 M $\Omega$ into 50 $\Omega$  Pulse Rise Time 4 mV to 2.5 V p-p  Time Marker <sup>2</sup> into 50 $\Omega$	5 mV to 5 V p-p  5 mV to 5.5 V p-p 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz  (0 to 33) V p-p (0 to 6.5) V p-p  1 kHz to 10 MHz  2 ns to 20 ms 50 ms to 5 s	23 mV/V + 300 $\mu$ V  20 mV/V + 0.1 mV 25 mV/V + 0.1 mV 47 mV/V + 0.1 mV  35 mV/V + 0.1 mV 35 mV/V + 0.1 mV  < 350 ps  2.5 $\mu$ s/s (25 + 1 000t) $\mu$ s/s	Fluke 5520A/SC600 Multifunction Calibrator
Electrical Simulation of Thermocouple Indicators <sup>1</sup>	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	0.51 °C 0.4 °C 0.35 °C 0.39 °C 0.35 °C 0.31 °C 0.36 °C 0.58 °C 0.97 °C	Fluke 5520A/SC600 Multifunction Calibrator



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicators <sup>1</sup>	Type E		Fluke 5520A/SC600 Multifunction Calibrator
	(-250 to -100) °C	0.58 °C	
	(-100 to -25) °C	0.19 °C	
	(-25 to 350) °C	0.17 °C	
	(350 to 650) °C	0.19 °C	
	(650 to 1 000) °C	0.25 °C	
	Type J		
	(-210 to -100) °C	0.32 °C	
	(-100 to -30) °C	0.19 °C	
	(-30 to 150) °C	0.17 °C	
	(150 to 760) °C	0.2 °C	
	(760 to 1 200) °C	0.27 °C	
	Type K		
	(-200 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.22 °C	
	(-25 to 120) °C	0.19 °C	
	(120 to 1 000) °C	0.31 °C	
	(1 000 to 1 372) °C	0.47 °C	
	Type R		
	Up to 250 °C	0.66 °C	
	(250 to 400) °C	0.41 °C	
(400 to 1 000) °C	0.39 °C		
(1 000 to 1 767) °C	0.47 °C		
Type S			
Up to 250 °C	0.55 °C		
(250 to 1 000) °C	0.42 °C		
(1 000 to 1 400) °C	0.43 °C		
(1 400 to 1 767) °C	0.54 °C		
Type T			
(-250 to -150) °C	0.73 °C		
(-150 to 0) °C	0.29 °C		
Up to 120 °C	0.19 °C		
(120 to 400) °C	0.17 °C		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicators <sup>1</sup>	Pt 385, 100 Ω		Fluke 5520A/SC600 Multifunction Calibrator
	(-200 to 0) °C	0.06 °C	
	(0 to 100) °C	0.09 °C	
	(100 to 300) °C	0.11 °C	
	(300 to 400) °C	0.12 °C	
	(400 to 630) °C	0.14 °C	
	(630 to 800) °C	0.27 °C	
	Pt 3926, 100 Ω		
	(-200 to 0) °C	0.06 °C	
	(0 to 100) °C	0.09 °C	
	(100 to 300) °C	0.11 °C	
	(300 to 400) °C	0.12 °C	
	(400 to 630) °C	0.14 °C	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.29 °C	
	(-190 to -80) °C	0.05 °C	
	(-80 to 0) °C	0.06 °C	
	(0 to 100) °C	0.07 °C	
	(100 to 260) °C	0.08 °C	
	(260 to 300) °C	0.1 °C	
	(300 to 400) °C	0.11 °C	
	(400 to 600) °C	0.12 °C	
	(600 to 630) °C	0.27 °C	
	Pt 385, 200 Ω		
	(-200 to 100) °C	0.05 °C	
	(100 to 260) °C	0.06 °C	
	(260 to 300) °C	0.14 °C	
	(300 to 400) °C	0.15 °C	
	(400 to 600) °C	0.17 °C	
	(600 to 630) °C	0.19 °C	
Pt 385, 500 Ω			
(-200 to -80) °C	0.05 °C		
(-80 to 100) °C	0.06 °C		
(100 to 260) °C	0.07 °C		
(260 to 400) °C	0.1 °C		
(400 to 600) °C	0.11 °C		
(600 to 630) °C	0.13 °C		



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicators <sup>1</sup>	Pt 385, 1000 Ω		Fluke 5520A/SC600 Multifunction Calibrator
	(-200 to 0) °C	0.04 °C	
	(0 to 100) °C	0.05 °C	
	(100 to 260) °C	0.06 °C	
	(260 to 300) °C	0.07 °C	
	(300 to 600) °C	0.08 °C	
	(600 to 630) °C	0.27 °C	
	PtNi 385, 120 Ω		
	(-80 to 100) °C	0.09 °C	
	(100 to 260) °C	0.17 °C	
Cu 427, 10 Ω			
(-100 to 260) °C	0.35 °C		

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency - Measure	1 Hz to 10 MHz	61 pHz/Hz	Datum 9390-6000, ExacTime GPS
Frequency - Source	10 MHz	2.9 pHz/Hz	

**Services performed at satellite location**

1745 Lakeville Rd  
Avon, NY 14414

**Length – Dimensional metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gage Blocks <sup>2</sup>	Up to 1 in (1 to 6) in	(2.9 + 1.9L) μin (0.4 + 4.2L) μin	Heidenhain ND281 Linear Encoder, Grade 0.5 Gage Blocks
Length Standards <sup>1</sup>	Up to 6 in	34 μin	Heidenhain ND281 Linear Encoder, Grade 1 Gage Blocks
Calipers <sup>1</sup>	6 in Up to 80 in	780 μin 2 300 μin	Grade 2 Gage Blocks



**Length – Dimensional metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers <sup>1</sup>	1 in Up to 54 in	82 μin 570 μin	Grade 2 Gage Blocks
Indicators <sup>1</sup>	Up to 2 in	87 μin	
Height Gages <sup>1</sup>	Up to 24 in	200 μin	
Cylindrical O.D.	Up to 1 in (1 to 4) in (4 to 6) in (6 to 10) in	8 μin 18 μin 27 μin 70 μin	Heidenhain ND281 Linear Encoder, Grades 0.5 and 1 Gage Blocks, Bench Micrometer
Cylindrical I.D	Up to 1 in (1 to 4) in (4 to 6) in (6 to 12) in	21 μin 35 μin 51 μin 82 μin	Zeiss ULM Master Rings
Thread O.D <sup>1</sup> Simple Pitch Diameter (6 to 120) TPI	Up to 1 in (1 to 10) in	57 μin 83 μin	Bench Micrometer Gage Blocks, Thread Wires

**Mass**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Force - Compression <sup>1</sup>	Up to 60 lbf	0.02 lbf	Class F Weights
	(60 to 500) lbf	0.06 % of reading	Tovey SSC-500 Load Cell
	(500 to 2 000) lbf	0.096 % of reading	Tovey SSC-2K Load Cell
	(2 000 to 5 000) lbf	0.16 % of reading	Sensotec 41/0572 Load Cell
	(5 000 to 20 000) lbf	0.3 % of reading	Lebow 3194-20K Load Cell
Force - Tension <sup>1</sup>	Up to 60 lbf	0.02 lbf	Class F Weights
	(60 to 500) lbf	0.06 % of reading	Tovey SSC-500 Load Cell
	(500 to 2 000) lbf	0.096 % of reading	Tovey SSC-2K Load Cell



Mass

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Transducers	(1 to 500) ozf·in	0.16 ozf·in	Torque Wheel w/Weights
	(30 to 2 000) lbf·in (150 to 1 000) lbf·ft	0.24 lbf·in 0.15 lbf·ft	Torque Arm w/Weights
Torque Wrenches <sup>1</sup>	(0.5 to 215) ozf·in	1.4 % of reading	Lebow 2120-200 Torque Cell
	(1 to 5) lbf·ft	1.7 % of reading	ASG DTT-100 Torque tester
	(5 to 100) lbf·ft	1.4 % of reading	Futek TRD-305 Torque Cell
	(100 to 1 000) lbf·ft	1.2 % of reading	Lebow 2133-106 Torque Cell
Scales and Balances <sup>1</sup>	(5 to 150) lb (150 to 500) lb	0.08 lb 0.17 lb	Class F Weights
	(0.001 to 500) g 500 g to 2 kg (2 to 6) kg (6 to 12) kg	1.7 mg 18 mg 0.19 g 1.8 g	Class S Weights
Pressure – Source <sup>1</sup>	(0.001 to 150) psia	0.02 psi	Mensor 2101 Digital Pressure Gage
	(4 to 204) in H <sub>2</sub> O	0.06 % of reading	Ametek PK104WC Deadweight Tester
	(5 to 10 000) psig	0.02 % of reading	Pressurements Deadweight Tester
Mass <sup>1</sup>	(0.002 to 200) g 200 g to 8.1 kg	0.61 mg 37 mg	Class 1 Weights

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,  $t$  = time in seconds
3. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1183.

  
 Vice President