



# CERTIFICATE OF ACCREDITATION

**ANSI National Accreditation Board**  
11617 Coldwater Road, Fort Wayne, IN 46845 USA

This is to certify that

**Transcat-Dayton**  
**2056 South Alex Road**  
**West Carrollton, OH 45449**

has been assessed by ANAB and meets the requirements of international standard

**ISO/IEC 17025:2017**

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 activities to which this accreditation applies

AC-2489.06

Certificate Number



ANAB Approval

Certificate Valid Through: 09/07/2021  
Version No. 003 Issued: 11/07/2019



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)

**Transcat – Dayton**  
2056 South Alex Road  
West Carrollton, OH 45449  
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**CALIBRATION**

Valid to: **September 7, 2021**

Certificate Number: **AC-2489.06**

**Chemical Quantities**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters	4 pH	0.012 pH	Standard Solutions
	7 pH	0.011 pH	
	10 pH	0.012 pH	
Conductivity Meters	1 $\mu$ S	0.3 $\mu$ S	Standard Solutions
	10 $\mu$ S	0.3 $\mu$ S	
	100 $\mu$ S	2.1 $\mu$ S	
	1 000 $\mu$ S	5 $\mu$ S	
	1 413 $\mu$ S	4 $\mu$ S	
	10 000 $\mu$ S	44 $\mu$ S	
	100 000 $\mu$ S	330 $\mu$ S	
	150 000 $\mu$ S	570 $\mu$ S	
200 000 $\mu$ S	670 $\mu$ S		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Current – Measuring Equipment <sup>1</sup>	0 $\mu$ A to 220 $\mu$ A		Fluke 5720A
	10 Hz to 20 Hz	0.032 % + 16 nA	
	20 Hz to 40 Hz	0.019 % + 10 nA	
	40 Hz to 1 kHz	0.014 % + 8 nA	
	1 kHz to 5 kHz	0.026 % + 10 nA	
	5 kHz to 10 kHz	0.11 % + 65 nA	
	220 $\mu$ A to 2.2 mA		
	10 Hz to 20 Hz	0.031 % + 40 nA	
	20 Hz to 40 Hz	0.018 % + 35 nA	
	40 Hz to 1 kHz	0.014 % + 35 nA	
	1 kHz to 5 kHz	0.021 % + 0.11 $\mu$ A	
	5 kHz to 10 kHz	0.11 % + 0.65 $\mu$ A	
	2.2 mA to 22 mA		
	10 Hz to 20 Hz	0.033 % + 0.4 $\mu$ A	
	20 Hz to 40 Hz	0.02 % + 0.35 $\mu$ A	
	40 Hz to 1 kHz	0.015 % + 0.35 $\mu$ A	
	1 kHz to 5 kHz	0.022 % + 0.55 $\mu$ A	
	5 kHz to 10 kHz	0.11 % + 5 $\mu$ A	
22 mA to 220 mA			
10 Hz to 20 Hz	0.033 % + 4 $\mu$ A		
20 Hz to 40 Hz	0.018 % + 3.5 $\mu$ A		
40 Hz to 1 kHz	0.014 % + 2.5 $\mu$ A		
1 kHz to 5 kHz	0.021 % + 3.5 $\mu$ A		
5 kHz to 10 kHz	0.11 % + 10 $\mu$ A		

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Current – Measuring Equipment <sup>1</sup>	220 mA to 2.2 A		Fluke 5720A
	20 Hz to 1 kHz	0.027 % + 35 μA	
	1 kHz to 5 kHz	0.045 % + 80 μA	
	5 kHz to 10 kHz	0.7 % + 0.16 mA	
	2.2 A to 11 A		
	40 Hz to 1 kHz	0.047 % + 0.17 mA	
	1 kHz to 5 kHz	0.095 % + 0.38 mA	
	5 kHz to 10 kHz	0.36 % + 0.75 mA	
	11 A to 20 A		
	45 Hz to 100Hz	0.091 % + 3.9 mA	
	100 Hz to 1 kHz	0.12 % + 3.9 mA	
	1 kHz to 5 kHz	2.3 % + 3.9 mA	
Extended Frequency Ranges <sup>1</sup>	29 μA to 330μA		Fluke 5520A
	10 kHz to 30 kHz	1.2 % + 0.31 μA	
	330 μA to 3.3 mA		
	10 kHz to 30 kHz	0.78 % + 0.47 μA	
	3.3 mA to 33 mA		
	10 kHz to 30 kHz	0.31 % + 3 μA	
	29 mA to 330 mA		
	10 kHz to 30 kHz	0.31 % + 0.16 mA	
Clamp-on Ammeter Toroidal Type <sup>1</sup> Transformer Type	20 A to 150 A		Fluke 5520A with 5500A/Coil
	45 Hz to 65 Hz	0.34 % + 30 mA	
	65 Hz to 440 Hz	0.95 % + 48 mA	
	150 A to 1 000 A		
	45 Hz to 65 Hz	0.38 % + 0.12 A	
	65 Hz to 440 Hz	1.2 % + 0.22 A	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Clamp-on Ammeter Non-Toroidal Type <sup>1</sup> Hall Effect Sensor	20 A to 150 A 45 Hz to 65 Hz 65 Hz to 440 Hz	 0.65 % + 0.29 A 1.2 % + 0.29 A	Fluke 5520A with 5500A/Coil
AC Current – Measure <sup>1</sup>	0 μA to 100 μA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 1 kHz	 0.46 % + 35 nA 0.17 % + 35 nA 0.073 % + 35 nA 0.073 % + 35 nA	HP 3458A
	100 μA to 1 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	 0.46 % + 0.23 μA 0.17 % + 0.23 μA 0.071 % + 0.23 μA 0.039 % + 0.23 μA	
	1 mA to 10 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	 0.46 % + 2.3 μA 0.17 % + 2.3 μA 0.071 % + 2.3 μA 0.039 % + 2.3 μA	
	10 mA to 100 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 100 Hz 100 Hz to 5 kHz	 0.46 % + 23 μA 0.17 % + 23 μA 0.071 % + 23 μA 0.038 % + 23 μA	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Current – Measure <sup>1</sup>	100 mA to 1 A		HP 3458A
	10 Hz to 20 Hz	0.46 % + 0.23 mA	
	20 Hz to 45 Hz	0.19 % + 0.23 mA	
	45 Hz to 100 Hz	0.098 % + 0.23 mA	
	100 Hz to 5 kHz	0.12 % + 0.23 mA	
1 A to 100 A	50 Hz to 1 kHz	0.12 % + 2.3 mA	CS-100 w/3458A
DC Current – Measuring Equipment <sup>1</sup>	0 μA to 220 μA	45 μA/A + 6.9 nA	Fluke 5720A
	220 μA to 2.2 mA	39 μA/A + 8.1 nA	
	2.2 mA to 22 mA	39 μA/A + 46 nA	
	22 mA to 220 mA	58 μA/A + 0.7 μA	
	220 mA to 2.2 A	0.24 mA/A + 12 μA	
	2.2 A to 11 A	0.4 mA/A + 0.48 mA	Fluke 5720A with 5725A Amplifier
11 A to 20 A		0.084 % + 0.58 mA	Fluke 5520A
Clamp-on Ammeter Non-Toroidal Type <sup>1</sup> Hall Effect Sensor	20 A to 150 A	0.58 % + 0.16 A	Fluke 5520A with 5500A/Coil
	150 A to 1 000 A	0.59 % + 0.58 A	
DC Current – Measure <sup>1</sup>	0 μA to 100 μA	33 μA/A + 0.9 nA	Agilent 3458A opt. 2
	100 μA to 1 mA	29 μA/A + 5.8 nA	
	1 mA to 10 mA	29 μA/A + 58 nA	
	10 mA to 100 mA	46 μA/A + 0.58 μA	
	100 mA to 1 A	0.13 mA/A + 12 μA	Agilent 3458A opt. 2
	1 A to 100 A	0.012 % + 0.53 mA	Ohm-Labs CS-100 w/3458A opt. 2
	100 A to 1 kA	0.31 % + 10 mA	Canadian Shunt LC-1000-50 w/ w/3458A opt. 2

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
DC Resistance – Measuring Equipment <sup>1</sup> (where V is DUT voltage)	1 mΩ	0.16 mΩ/Ω	Standard Resistor
	10 mΩ	0.16 mΩ/Ω	
	100 mΩ	0.16 mΩ/Ω	
	1 GΩ to 10 GΩ	0.58 % + 1.2 μΩ/Ω/V	IET HRRS-B-7-100k-5kV
	10 GΩ to 100 GΩ	1.2 % + 2.3 μΩ/Ω/V	
	100 GΩ to 1 TΩ	1.2 % + 5.8 μΩ/Ω/V	
DC Resistance – Measuring Equipment and Measure <sup>1</sup>	0 Ω to 25 Ω	0.056 mΩ	Hart 1590 with Reference Resistor
	25 Ω to 400 Ω	2.1 μΩ/Ω	
	400 Ω to 1 kΩ	4.4 μΩ/Ω	
	1 kΩ to 40 kΩ	10 μΩ/Ω	
DC Resistance – Measuring Equipment and Measure <sup>1</sup>	0.01 Ω to 10 Ω	20 μΩ/Ω + 58 μΩ	Agilent 3458A opt. 2 with Decade Resistor
	10 Ω to 100 Ω	15 μΩ/Ω + 0.58 mΩ	
	100 Ω to 1 kΩ	13 μΩ/Ω + 0.58 mΩ	
	1 kΩ to 10 kΩ	12 μΩ/Ω + 5.8 mΩ	
	10 kΩ to 100 kΩ	13 μΩ/Ω + 58 mΩ	
	100 kΩ to 1 MΩ	21 μΩ/Ω + 2.3 Ω	
	1 MΩ to 10 MΩ	62 μΩ/Ω + 0.12 kΩ	
	10 MΩ to 100 MΩ	0.059 % + 1.2 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 12 kΩ	
DC Voltage – Measure <sup>1</sup>	0 mV to 100 mV	8.3 μV/V + 0.53 μV	Agilent 3458A opt. 2
	100 mV to 1 V	5.3 μV/V + 0.53 μV	
	1 V to 10 V	5.3 μV/V + 0.53 μV	
	10 V to 100 V	7.6 μV/V + 35 μV	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment	
DC Voltage – Measure <sup>1</sup>	100 V to 500 V	11 $\mu$ V/V + 0.12 mV	Agilent 3458A opt. 2	
	500 V to 800 V	17 $\mu$ V/V + 0.12 mV		
	800 V to 1 kV	21 $\mu$ V/V + 0.12 mV		
		1 kV to 10 kV	0.035 % + 2.1 V	Vitretek 4700A
		10 kV to 35 kV	0.041 % + 37 V	Vitretek 4700A/HVP-35
		35 kV to 70 kV	0.038 % + 55 V	Vitretek 4700A/HVL-70
	70 kV to 100 kV	0.063 % + 0.16 kV	Vitretek 4700A/ HVL-100	
DC Voltage – Measuring Equipment <sup>1</sup>	0 mV to 220 mV	9.1 $\mu$ V/V + 0.4 $\mu$ V	Fluke 5720A	
	220 mV to 2.2 V	5.7 $\mu$ V/V + 0.7 $\mu$ V		
	2.2 V to 11 V	4.4 $\mu$ V/V + 2.5 $\mu$ V		
	11 V to 22 V	4 $\mu$ V/V + 4 $\mu$ V		
	22 V to 220 V	6.3 $\mu$ V/V + 40 $\mu$ V		
	220 V to 1.1 kV	7.6 $\mu$ V/V + 0.4 mV		
AC Voltage – Measuring Equipment <sup>1</sup>	0 mV to 2.2 mV		Fluke 5720A	
	10 Hz to 20 Hz	0.16 % + 4 $\mu$ V		
	20 Hz to 40 Hz	0.1 % + 4 $\mu$ V		
	40 Hz to 20 kHz	0.077 % + 4 $\mu$ V		
	20 kHz to 50 kHz	0.12 % + 4 $\mu$ V		
	50 kHz to 100 kHz	0.17 % + 5 $\mu$ V		
	100 kHz to 300 kHz	0.33 % + 10 $\mu$ V		
	300 kHz to 500 kHz	0.47 % + 20 $\mu$ V		
	500 kHz to 1 MHz	0.58 % + 20 $\mu$ V		



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Voltage – Measuring Equipment <sup>1</sup>	2.2 mV to 22 mV		Fluke 5720A
	10 Hz to 20 Hz	0.044 % + 4 μV	
	20 Hz to 40 Hz	0.031 % + 4 μV	
	40 Hz to 20 kHz	0.015 % + 4 μV	
	20 kHz to 50 kHz	0.031 % + 4 μV	
	50 kHz to 100 kHz	0.059 % + 5 μV	
	100 kHz to 300 kHz	0.12 % + 10 μV	
	300 kHz to 500 kHz	0.16 % + 20 μV	
	500 kHz to 1 MHz	0.3 % + 20 μV	
	22 mV to 220 mV		
	10 Hz to 20 Hz	0.028 % + 12 μV	
	20 Hz to 40 Hz	0.011 % + 7 μV	
	40 Hz to 20 kHz	0.009 % + 7 μV	
	20 kHz to 50 kHz	0.021 % + 7 μV	
	50 kHz to 100 kHz	0.047 % + 17 μV	
100 kHz to 300 kHz	0.092 % + 20 μV		
300 kHz to 500 kHz	0.14 % + 25 μV		
500 kHz to 1 MHz	0.28 % + 45 μV		
220 mV to 2.2 V			
10 Hz to 20 Hz	0.028 % + 40 μV		
20 Hz to 40 Hz	0.01 % + 15 μV		
40 Hz to 20 kHz	0.005 % + 8 μV		
20 kHz to 50 kHz	0.008 % + 10 μV		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Voltage – Measuring Equipment <sup>1</sup>	220 mV to 2.2 V		Fluke 5720A
	50 kHz to 100 kHz	0.012 % + 30 μV	
	100 kHz to 300 kHz	0.043 % + 80 μV	
	300 kHz to 500 kHz	0.1 % + 0.2 mV	
	500 kHz to 1 MHz	0.18 % + 0.3 mV	
	2.2 V to 22 V		
	10 Hz to 20 Hz	0.028 % + 0.4 mV	
	20 Hz to 40 Hz	0.01 % + 0.15 mV	
	40 Hz to 20 kHz	0.005 % + 0.05 mV	
	20 kHz to 50 kHz	0.008 % + 0.1 mV	
	50 kHz to 100 kHz	0.011 % + 0.2 mV	
	100 kHz to 300 kHz	0.03 % + 0.6 mV	
	300 kHz to 500 kHz	0.1 % + 2 mV	
	500 kHz to 1 MHz	0.17 % + 3.2 mV	
	22 V to 220 V		Fluke 5720A with 5725A
	10 Hz to 20 Hz	0.028 % + 4 mV	
	20 Hz to 40 Hz	0.01 % + 1.5 mV	
	40 Hz to 20 kHz	0.006 % + 0.6 mV	
	20 kHz to 50 kHz	0.009 % + 1 mV	
	50 kHz to 100 kHz	0.016 % + 2.5 mV	
	100 kHz to 300 kHz	0.09 % + 16 mV	
	300 kHz to 500 kHz	0.44 % + 40 mV	
	500 kHz to 1 MHz	0.8 % + 80 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Voltage – Measuring Equipment <sup>1</sup>	220 V to 750 V		Fluke 5720A with 5725A
	30 kHz to 50 kHz	0.061 % + 11 mV	
	50 kHz to 100 kHz	0.23 % + 45 mV	
	750 V to 1 100 V		
	40 Hz to 1 kHz	0.011 % + 4 mV	
	1 kHz to 20 kHz	0.017 % + 6 mV	
	20 kHz to 30 kHz	0.061 % + 11 mV	
AC Voltage – Measure <sup>1</sup>	0 mV to 10 mV		HP 3458A opt. 2
	1 Hz to 40 Hz	0.04 % + 3.5 μV	
	40 Hz to 1 kHz	0.03 % + 1.3 μV	
	1 kHz to 20 kHz	0.04 % + 1.3 μV	
	20 kHz to 50 kHz	0.16 % + 1.3 μV	
	50 kHz to 100 kHz	0.59 % + 1.3 μV	
	100 kHz to 300 kHz	4.6 % + 2.3 μV	
	10 mV to 100 mV		
	1 Hz to 40 Hz	0.013 % + 4.6 μV	
	40 Hz to 1 kHz	0.009 7 % + 2.3 μV	
	1 kHz to 20 kHz	0.017 % + 2.3 μV	
	20 kHz to 50 kHz	0.038 % + 2.3 μV	
	50 kHz to 100 kHz	0.094 % + 2.3 μV	
	100 kHz to 300 kHz	0.37 % + 12 μV	
300 kHz to 1 MHz	1.2 % + 12 μV		



# ANSI National Accreditation Board

## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Voltage – Measure <sup>1</sup>	100 mV to 1 V		HP 3458A opt. 2
	1 Hz to 40 Hz	0.008 8 % + 46 μV	
	40 Hz to 1 kHz	0.008 3 % + 23 μV	
	1 kHz to 20 kHz	0.017 % + 23 μV	
	20 kHz to 50 kHz	0.036 % + 23 μV	
	50 kHz to 100 kHz	0.094 % + 23 μV	
	100 kHz to 300 kHz	0.35 % + 0.12 mV	
	300 kHz to 1 MHz	1.2 % + 0.12 mV	
	1 V to 10 V		
	1 Hz to 40 Hz	0.009 9 % + 0.46 mV	
	40 Hz to 1 kHz	0.008 6 % + 0.23 mV	
	1 kHz to 20 kHz	0.017 % + 0.23 mV	
	20 kHz to 50 kHz	0.036 % + 0.23 mV	
	50 kHz to 100 kHz	0.093 % + 0.23 mV	
	100 kHz to 300 kHz	0.35 % + 1.2 mV	
	300 kHz to 1 MHz	1.2 % + 1.2 mV	
	10 V to 100 V		
	1 Hz to 40 Hz	0.025 % + 4.6 mV	
	40 Hz to 1 kHz	0.024 % + 2.3 mV	
	1 kHz to 20 kHz	0.024 % + 2.3 mV	
	20 kHz to 50 kHz	0.042 % + 2.3 mV	
50 kHz to 100 kHz	0.14 % + 2.3 mV		
100 kHz to 300 kHz	0.46 % + 12 mV		
300 kHz to 1 MHz	1.7 % + 12 mV		



# ANSI National Accreditation Board

## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Voltage – Measure <sup>1</sup>	100 V to 700 V		HP 3458A opt. 2
	1 Hz to 40 Hz	0.048 % + 46 mV	
	40 Hz to 1 kHz	0.048 % + 23 mV	
	1 kHz to 20 kHz	0.071 % + 23 mV	
	20 kHz to 50 kHz	0.14 % + 23 mV	
	50 kHz to 100 kHz	0.35 % + 23 mV	
	0.7 kV to 10 kV		Vitrek 4700A
	30 Hz to 200 Hz	0.14 % + 2.1 V	
	200 Hz to 450 Hz	0.46 % + 2.1 V	
	10 kV to 35 kV		Vitrek 4700A/HVP-35
	30 Hz to 200 Hz	0.12 % + 37 V	
	200 Hz to 450 Hz	0.71 % + 37 V	
35 kV to 70 kV		Vitrek 4700A/HVL-70	
30 Hz to 100 Hz	0.12 % + 55 V		
100 Hz to 200 Hz	0.69 % + 55 V		
70 kV to 100 kV		Vitrek 4700A/HVL-100	
30 Hz to 70 Hz	0.15 % + 0.16 kV		
70 Hz to 200 Hz	1.2 % + 0.16 kV		
Capacitance – Measuring Equipment <sup>1</sup>	0.19 nF to 1.1 nF		Fluke 5520A
	10 Hz to 10 kHz	0.4 % + 7.8 pF	
	1.1 nF to 3.3 nF		
	10 Hz to 3 kHz	0.4 % + 7.8 pF	
	3.3 nF to 11 nF		
	10 Hz to 1 kHz	0.22 % + 7.8 pF	



# ANSI National Accreditation Board

## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Capacitance – Measuring Equipment <sup>1</sup>	11 nF to 33 nF 10 Hz to 1 kHz	0.22 % + 78 pF	Fluke 5520A
	33 nF to 110 nF 10 Hz to 1 kHz	0.22 % + 78 pF	
	110 nF to 330 nF 10 Hz to 1 kHz	0.22 % + 0.23 nF	
	0.33 μF to 1.1 μF 10 Hz to 600 Hz	0.22 % + 0.78 nF	
	1.1 μF to 3.3 μF 10 Hz to 300 Hz	0.22 % + 2.3 nF	
	3.3 μF to 11 μF 10 Hz to 150 Hz	0.22 % + 7.8 nF	
	11 μF to 33 μF 10 Hz to 120 Hz	0.33 % + 23 nF	
	33 μF to 110 μF 10 Hz to 80 Hz	0.42 % + 78 nF	
	110 μF to 330 μF DC to 50 Hz	0.42 % + 0.23 μF	
	0.33 mF to 1.1 mF DC to 20 Hz	0.36 % + 0.78 μF	
	1.1 mF to 3.3 mF DC to 6 Hz	0.35 % + 2.3 μF	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Capacitance – Measuring Equipment <sup>1</sup>	3.3 mF to 11 mF DC to 2 Hz	0.35 % + 7.8 μF	Fluke 5520A
	11 mF to 33 mF DC to 0.6 Hz	0.58 % + 23 μF	
	33 mF to 110 mF DC to 0.2 Hz	0.85 % + 78 μF	
Electrical Simulation of Thermocouples <sup>1</sup>			Ectron 1140A
Type R	-50 °C to 1 768 °C	0.27 °C	
Type S	-50 °C to 1 768 °C	0.23 °C	
Type E	-270 °C to 1 000 °C	0.067 °C	
Type T	-270 °C to 400 °C	0.076 °C	
Type K	-270 °C to 1 372 °C	0.07 °C	
Type J	-210 °C to 1 200 °C	0.068 °C	
Type B	(250 to 350) °C	1 °C	
	(350 to 445) °C	0.77 °C	
	(445 to 580) °C	0.61 °C	
	(580 to 750) °C	0.47 °C	
	(750 to 1 000) °C	0.39 °C	
	(1 000 to 1 820) °C	0.31 °C	
Type C	(0 to 250) °C	0.21 °C	
	(250 to 1 000) °C	0.17 °C	
	(1 000 to 1 500) °C	0.19 °C	
	(1 500 to 1 800) °C	0.22 °C	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouples <sup>1</sup> Type C	(1 800 to 2 000) °C	0.24 °C	Ectron 1140A
	(2 000 to 2 250) °C	0.30 °C	
	(2 250 to 2 315) °C	0.33 °C	
Type E	(-270 to -245) °C	2.1 °C	
	(-245 to -195) °C	0.20 °C	
	(-195 to -155) °C	0.11 °C	
	(-155 to -90) °C	0.093 °C	
	(-90 to 0) °C	0.083 °C	
	(0 to 15) °C	0.082 °C	
	(15 to 890) °C	0.073 °C	
	(890 to 1 000) °C	0.082 °C	
Type J	(-170 to -180) °C	0.13 °C	
	(-180 to -120) °C	0.11 °C	
	(-120 to -50) °C	0.092 °C	
	(-50 to 990) °C	0.082 °C	
	(990 to 1 200) °C	0.082 °C	
Type K	(-270 to -255) °C	2.3 °C	
	(-255 to -195) °C	0.73 °C	
	(-195 to -115) °C	0.14 °C	
	(-115 to -55) °C	0.1 °C	
	(-55 to 1 000) °C	0.084 °C	
	(1 000 to 1 372) °C	0.093 °C	





Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouples <sup>1</sup>  Type N	(-270 to -260) °C	5.1 °C	Ectron 1140A
	(-260 to -200) °C	1.1 °C	
	(-200 to -140) °C	0.25 °C	
	(-140 to -70) °C	0.16 °C	
	(-70 to 25) °C	0.13 °C	
	(25 to 160) °C	0.11 °C	
	(160 to 1 300) °C	0.10 °C	
Type R	(-50 to -30) °C	0.68 °C	
	(-30 to 45) °C	0.58 °C	
	(45 to 160) °C	0.42 °C	
	(160 to 380) °C	0.31 °C	
	(380 to 775) °C	0.28 °C	
	(775 to 1 768) °C	0.23 °C	
Type S	(-50 to -30) °C	0.65 °C	
	(-30 to 45) °C	0.59 °C	
	(45 to 105) °C	0.42 °C	
	(105 to 310) °C	0.35 °C	
	(310 to 615) °C	0.31 °C	
	(615 to 1 768) °C	0.27 °C	
Type T	(-270 to -255) °C	1.8 °C	
	(-255 to -240) °C	0.52 °C	
	(-240 to -210) °C	0.32 °C	
	(-210 to -150) °C	0.19 °C	
	(-150 to -40) °C	0.13 °C	
	(-40 to 100) °C	0.092 °C	
	(100 to 400) °C	0.083 °C	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Power Measuring Equipment <sup>1</sup> DC Power			Fluke 5520A
0.33 mA to 330 mA	11 μW to 1.1 mW	0.024 %	
	1.1 mW to 110 mW	0.027 %	
	0.11W to 110 W	0.024 %	
	110 W to 330 W	0.018 %	
0.33 A to 3 A	11 W to 110 mW	0.044 %	
	0.11 W to 990 W	0.053 %	
	1 W to 3 kW	0.009 6 %	
3 A to 20.5 A	0.099 W to 0.99 W	0.088 %	
	0.99 W to 6.8 kW	0.07 %	
	6.8 W to 20.5 kW	0.04 %	
AC Power <sup>4</sup> (PF=1) 10 Hz to 65 Hz			
3.3 mA to 9.0 mA	0.11 mW to 3 mW	0.13%	
	3 mW to 9 W	0.077%	
9.0 mA to 33 mA	0.3 mW to 10 mW	0.089 %	
	10 mW to 33W	0.077%	
33 mA to 90 mA	1 mW to 30 mW	0.071 %	
	30 mW to 90 W	0.057 %	
90 mA to 330 mA	3 mW to 100 mW	0.089 %	
	100 mW to 300 W	0.078 %	
0.33 A to 0.9 A	11 mW to 300 mW	0.071 %	
	300 mW to 900 W	0.081 %	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
AC Power <sup>4</sup> (PF=1) 10 Hz to 65 Hz 0.9 A to 2.2 A	30 mW to 720 mW	0.089 %	Fluke 5520A
	720 mW to 2 kW	0.079 %	
2.2 A to 4.5 A	80 mW to 1.4 W	0.088 %	
	1.4 W to 4.5 kW	0.18 %	
4.5 A to 20.5 A	150 mW to 6.7 W	0.17 %	
	6.7 W to 20 kW	0.17 %	
Phase Meters – Measure Equipment <sup>1</sup>	0° to 180°		Fluke 5520A
	10 Hz to 65 Hz	0.11°	
	65 Hz to 500 Hz	0.2°	
	500 Hz to 1 kHz	0.4°	
	1 kHz to 5 kHz	1.9°	
	5 kHz to 10 kHz	3.9°	
Oscilloscopes <sup>1</sup> Amplitude DC <sup>1</sup> into 50 Ω Load into 1 MΩ Load	(-6.6 to 6.6) V	0.20 % + 31 μV	Fluke 5520A/SC1100
	(-130 to 130) V	0.039 % + 31 μV	
Amplitude Square Wave <sup>1</sup> into 50 Ω Load Rate: 10 Hz to 10 kHz	1 mV <sub>(pk-pk)</sub> to 6.6 V <sub>(pk-pk)</sub>	0.19 % + 31 μV	
	into 1 MΩ Load Rate: 10 Hz to 1 kHz	1 mV <sub>(pk-pk)</sub> to 6.6 V <sub>(pk-pk)</sub>	
Rate: 1 kHz to 10 kHz	1 mV <sub>(pk-pk)</sub> to 6.6 V <sub>(pk-pk)</sub>	0.19 % + 31 μV	



Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Timing – Generate <sup>1</sup> 50 Ω Load	5 s	0.30 %	Fluke 5520A/SC1100
	2 s	0.12 %	
	1 s	0.062 %	
	500 ms	0.032 %	
	200 ms	0.014 %	
	100 ms	0.007 6 %	
	50 ms	0.004 6 %	
	20 mS to 1 nS	0.000 22 %	
Rise Time – Generate <sup>1,5</sup> 50 Ω Load 5.0 mV <sub>(pk-pk)</sub> to 2.5 V <sub>(pk-pk)</sub> Rate: 1 kHz to 2 MHz Rate: 2 MHz to 10 MHz	250 ps (nominal) 250 ps (nominal)	50 ps 50 ps	Fluke 5520A/SC1100
Rise Time – Measure <sup>1</sup>	≥ 5 ns	4 ns	Agilent DSO5012
Leveled Sine Wave Generate <sup>1</sup> 50 Ω Load 5.0 mV <sub>(pk-pk)</sub> to 5.5 V <sub>(pk-pk)</sub>	50 kHz 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz	1.8 % + 230 μV 2.8 % + 230 μV 3.2 % + 230 μV 4 % + 230 μV	Fluke 5520A/SC1100
5.0 mV <sub>(pk-pk)</sub> to 3.5 V <sub>(pk-pk)</sub>	600 MHz to 1 GHz	5.5 % + 230 μV	



# ANSI National Accreditation Board

## Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Bandwidth/Flatness Measure <sup>1</sup> 50 Ω (50 kHz Reference) 5.0 mV <sub>(pk-pk)</sub> to 5.5 V <sub>(pk-pk)</sub> 50 kHz to 100 MHz 100 MHz to 300 MHz 300 MHz to 600 MHz 5.0 mV <sub>(pk-pk)</sub> to 3.5 V <sub>(pk-pk)</sub> 600 MHz to 1.1 GHz		1.4 % + 78 μV 1.8 % + 78 μV 3.2 % + 78 μV 4 % + 78 μV	Fluke 5520A/SC1100
Input Impedance Measure <sup>1</sup> 50 Ω 1 MΩ	40 Ω to 60 Ω 500 kΩ to 1.5 MΩ	0.082 % 0.081 %	Fluke 5520A/SC1100
Input Capacitance Measure <sup>1</sup>	5.0 pF to 50 pF	3.9 % + 0.39 pF	Fluke 5520A/SC1100
Wave Generator – Source <sup>1</sup> Amplitude (10 Hz to 10 kHz) Sine, Square, Triangle 50 Ω Load 1 MΩ Load	1.8 mV <sub>(pk-pk)</sub> to 2.5 V <sub>(pk-pk)</sub> 1.8 mV <sub>(pk-pk)</sub> to 55 V <sub>(pk-pk)</sub>	2.3 % + 78 μV <sub>(pk-pk)</sub> 2.3 % + 78 μV <sub>(pk-pk)</sub>	Fluke 5520A/SC1100
Wave Generator – Source <sup>1</sup> Frequency Sine, Square, Triangle	10 Hz to 10 kHz	0.001 9 % + 0.012 Hz	Fluke 5520A/SC1100

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angle <sup>1</sup>			
Measure	0° to 360°	0.25°	Digital Protractor
Generate	0° to 75°	0° 00' 06.6"	Angle Blocks
	90°	0° 00' 02.7"	Master Square Comparison
Gage Blocks			
English, Steel	(0.01 to 1) in (1 to 4) in (4 to 20) in	3.3 μin (1.7 + 1.4 L) μin (5.5 + 1.4 L) μin	Gage Block Comparator
English, Chrome	(0.01 to 1) in (1 to 4) in	3.3 μin (1.7 + 1.4 L) μin	
Micrometers, Calipers <sup>1</sup>			
Inside, Outside, Depth, Step	(0 to 0.4) in (0.4 to 1.1) in (1 to 4) in (4 to 40) in	(8 + 1L) μin (7 + 2L) μin (4 + 5L) μin (5 + 8L) μin	Gage Blocks
Anvil Flatness	(0 to 1) in diameter	6.4 μin	Optical Flats
Anvil Parallelism	(0 to 1) in diameter	11 μin	Optical Parallel
Indicators <sup>1</sup>			
Dial, Digital, Drop, Snap	(0 to 1) in (1 to 4) in (4 to 24) in	(31 + 0.3L) μin (29 + 3L) μin (25 + 4L) μin	Gage Blocks, Amplifier
Test Indicators	(0 to 0.05) in	5.6 μin	ULM



Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Height – Generate <sup>1</sup> Height Gages	(0 to 1) in	(31 + 0.3L) μin	Gage Blocks, Amplifier
	(1 to 4) in	(29 + 3L) μin	
	(4 to 24) in	(25 + 4L) μin	
Height – Measure <sup>1</sup> Height and Caliper Masters, 1-2-3 blocks, Parallels	(0 to 4) in	(52 + 0.5L) μin	Gage Blocks, Amplifier
	(4 to 24) in	(41 + 3.7L) μin	
Length Single Axis  Outside Dimension	(0 to 1) in	(6.1 + 1.3L) μin	ULM
	(1 to 7) in	(4.5 + 4L) μin	
	(7 to 12) in	(2 + 4L) μin	
Inside Dimension	(0.04 to 0.125) in	11 μin	ULM
	(0.125 to 0.25) in	11 μin	
	(0.25 to 1) in	11 μin	
	(1 to 2.5) in	18 μin	
	(2.5 to 10) in	(18 + 3L) μin	
	(10 to 14) in	(39 + 3L) μin	
Length Measuring Equipment Linear Displacement <sup>1</sup>	0 in to 144 in	(1 + 2.1L) μin	Laser Interferometer
Plug Gages - Outside Diameter	(0 to 1) in	12 μin	ULM
	(1 to 7) in	(11 + 3L) μin	
Ring Gages - Inside Diameter	(0.04 to 0.125) in	11 μin	ULM
	(0.125 to 0.25) in	11 μin	
	(0.25 to 1) in	11 μin	
	(1 to 2.5) in	18 μin	
	(2.5 to 10) in	(18 + 3L) μin	
	(10 to 14) in	(39 + 3L) μin	

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Wires	2 TPI to 120 TPI (0.008 33 to 0.5) in	12 $\mu$ in	ULM
Thread Plug Gages  Pitch Diameter 60° Thread	(0 to 1) in (1 to 4) in (4 to 7) in	79 $\mu$ in 81 $\mu$ in 84 $\mu$ in	ULM w/Thread Wires
Major Diameter	(0 to 1) in (1 to 7) in (0 to 1.0) in	13 $\mu$ in (10 + 3L) $\mu$ in 79 $\mu$ in	ULM
Thread Ring Gages	(1 to 4) in (4 to 7) in	81 $\mu$ in 84 $\mu$ in	Master Setting Plugs Uncertainty of Setting Plug
Surface Plates <sup>1</sup>  Overall Flatness Local Area Flatness	(12 to 100) in (-0.001 to + 0.001) in	24 $\mu$ in + $\sqrt{D}$ $\mu$ in 32 $\mu$ in	Differential Levels Supramess
Optical Comparators <sup>1</sup>  Length  Squareness  Magnification Up to 12 in	(0 to 12) in  (0.04 to 0.5) in (0.5 to 1) in  10X to 50X	(80 + 19L) $\mu$ in  (110 + 1L) $\mu$ in (110 + 1.5L) $\mu$ in  (240 + 21L) $\mu$ in	Calibration Grids  Magnification Scale, Reticle
Flatness, Straightness and Parallelism <sup>1</sup>	(0 to 18) in	36 $\mu$ in	Gage Amplifier and Surface Plate



**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Kinematic Viscosity Viscosity Cups	18 mm <sup>2</sup> /s (cSt)	0.57 %	Viscosity Ref. Standards (Nominal at 25°C)
	32 mm <sup>2</sup> /s (cSt)	0.78 %	
	65 mm <sup>2</sup> /s (cSt)	0.62 %	
	117 mm <sup>2</sup> /s (cSt)	0.75 %	
	230 mm <sup>2</sup> /s (cSt)	0.91 %	
	392 mm <sup>2</sup> /s (cSt)	1.1 %	
	734 mm <sup>2</sup> /s (cSt)	0.82 %	
Force Measuring Equipment Tension and Compression Mass - Metric	0.1 lbf to 200 lbf	0.033 %	Dead Weight – Class F Weights
	30 kg	0.3 g	Echelon III
	20 kg	0.3 g	
Mass - Metric	10 kg	0.2 g	Echelon III
	5 kg	22 mg	
	2 kg	15 mg	
	1 kg	11 mg	
Mass - Avoirdupois	0.5 kg	11 mg	Echelon III
	65 lb	0.3 g	
	50 lb	0.2 g	
	30 lb	0.2 g	
	20 lb	0.2 g	
	10 lb	20 mg	
	5 lb	10 mg	
	3 lb	10 mg	
	2 lb	10 mg	
1 lb	10 mg		

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Rockwell Hardness – Measuring Equipment <sup>1</sup>	HRC		Hardness Blocks
	Low	0.42 HRC	
	Middle	0.35 HRC	
	High	0.34 HRC	
	HRBW		
	Low	0.46 HRBW	
Middle	0.36 HRBW		
High	0.43 HRBW		
Torque – Measuring Equipment <sup>1</sup>	2.5 lbf·in to 50 lbf·in	0.2 %	5 inch Torque Wheel with F Class Weights
	50 lbf·in to 250 lbf·ft	0.2 %	10 inch Torque Butterfly with F Class Weights
	250 lbf·in to 800 lbf·ft	0.2 %	40 inch Torque Arm with F Class Weights
Torque – Measure <sup>1</sup>	0.2 lbf·in to 5 lbf·in	1.7 % + 0.002 3 lbf·in	Tohnichi TDT60CN3-G
	2 lbf·in to 50 lbf·in	1.4 % + 0.023 lbf·in	Tohnichi TDT600CN3-G
	18 lbf·in to 295 lbf·ft	1 %	Stahlwille Torque Cells with Loader
	295 lbf·ft to 740 lbf·ft	1.7 %	
Scales and Balances – Metric <sup>1</sup>	20 kg	61 mg	Characterized ASTM Class 1 and 2 Mass Standards
	5 kg	4.4 mg	
	3 kg	2.7 mg	
	2 kg	1.8 mg	
	1 kg	3 mg	
	500 g	0.62 mg	
	300 g	0.62 mg	
	200 g	0.22 mg	
	100 g	0.22 mg	



Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Scales and Balances – Metric <sup>1</sup>	50 g	0.075 mg	Characterized ASTM Class 1 and 2 Mass Standards
	30 g	0.04 mg	
	20 g	0.04 mg	
	10 g	0.02 mg	
	5 g	0.02 mg	
	2 g	0.02 mg	
	1 g	0.02 mg	
	500 mg	0.004 7 mg	
	200 mg	0.004 7 mg	
	100 mg	0.004 7 mg	
	50 mg	0.004 7 mg	
	20 mg	0.004 7 mg	
	10 mg	0.004 7 mg	
	5 mg	0.004 7 mg	
	2 mg	0.004 7 mg	
1 mg	0.004 7 mg		
Scales and Balances – Avoirdupois <sup>1</sup>	0.5 lb to 500 lb	0.033 %	NIST Class F Weights
Pressure – Pneumatic <sup>1</sup>	-15 psi to 30 psi	0.002 2 psi	DHI RPM4 with Pressure Controller
	30 psi to 300 psi	0.0075 %	
	300 psi to 1 000 psi	0.01 %	
	-60 inH <sub>2</sub> O to -22 inH <sub>2</sub> O	0.009 % + 150 µinH <sub>2</sub> O	DHI PPC4 Controller
	-22 inH <sub>2</sub> O to 22 inH <sub>2</sub> O	0.002 2 inH <sub>2</sub> O	
	22 inH <sub>2</sub> O to 60 inH <sub>2</sub> O	0.009 % + 150 µinH <sub>2</sub> O	



**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-) <sup>2</sup>	Reference Standard, Method, and/or Equipment
Pressure – Pneumatic <sup>1</sup>	60 inH <sub>2</sub> O to 72 inH <sub>2</sub> O	0.006 7 inH <sub>2</sub> O	DHI PPC4 Controller
	72 inH <sub>2</sub> O to 832 inH <sub>2</sub> O	0.009 % + 150 μinH <sub>2</sub> O	
Pressure – Hydraulic <sup>1</sup>	200 psi to 1 600 psi	0.091 psi	Fluke P3125-PSI Deadweight Tester
	1 600 psi to 16 200 psi	0.006 %	
Pressure – Absolute <sup>1</sup>	0 psia to 30 psia	0.002 6 psia	DHI RPM4 with Pressure Controller
	30 psia to 300 psia	0.008 9 %	
	300 psia to 1 000 psia	0.01 %	

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity Measure <sup>1</sup> (-10 °C to 15 °C)	(0 to 95) %RH	2.1 % RH	Thermo-hygrometer
	(15 °C to 25 °C)	(0 to 90) %RH	
(90 to 95) %RH		2 % RH	
(25 °C to 40 °C)	(0 to 50) %RH	1.7 % RH	
	(50 to 75) %RH	2 % RH	
	(75 to 75) %RH	2.3 % RH	
(40 °C to 60 °C)	(0 to 50) %RH	2.7 % RH	
	(50 to 75) %RH	3.1 % RH	
	(75 to 75) %RH	3.6 % RH	
Generate (-10°C to 15°C)	(10 to 75) %RH	0.5 % RH	
	(75 to 95) %RH	0.65 % RH	



Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity Generate (15°C to 35°C)	(10 to 95) %RH	0.5 % RH	Humidity Generator
(35°C to 70°C)	(10 to 50) %RH	0.5 % RH	
	(50 to 75) %RH (75 to 95) %RH	0.7 % RH 0.85 % RH	
Temperature Measuring Equipment	-80 °C to -40 °C	1.9 mK	SPRT w/Precision Bath
	-40 °C to 100 °C	1.4 mK	
	100 °C to 270 °C	2.4 mK	
	270 °C to 400 °C	5.6 mK	
	400 °C to 600 °C	22 mK	SPRT w/Furnace
Measure <sup>1</sup>	-100 °C to 0.01 °C	11 mK	PRT w/Precision Indicator
	0.01 °C to 230 °C	19 mK	
	230 °C to 420 °C	25 mK	
	420 °C to 600 °C	36 mK	
	600 °C to 980 °C	0.87 % of reading + 1 °C	Type-K T/C w/T/C Indicator
Infrared Temperature - Measuring Equipment	-15 °C to 0 °C	0.8 °C	Black Body
	0 °C to 50 °C	0.75 °C	$\epsilon = 0.9$ to 1.0
	50 °C to 100 °C	0.7 °C	
	100 °C to 120 °C	0.76 °C	$\lambda = (8$ to 14) $\mu\text{m}$
	120 °C to 200 °C	0.95 °C	
	200 °C to 350 °C	1.6 °C	
	350 °C to 500 °C	2.1 °C	

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calibration of SPRT / PRTs	0.01 °C	0.6 mK	Comparison to TPW Cell
	156.598 °C	1.9 mK	Comparison to In Cell
	231.928 °C	2.1 mK	Comparison to Sn Cell
	419.527 °C	3.5 mK	Comparison to Zn Cell
	660.323 °C	8.6 mK	Comparison to Al Cell
SPRT / PRT Comparison	-195 °C	2.4 mK	Hart 5681 SPRT with NBPLN <sub>2</sub>
	-80 °C	1.9 mK	Hart 5681 SPRT with Precision Bath
	-38.8 °C	1.2 mK	

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency - Source and Measure In-Lab	10 MHz	$6.4 \times 10^{-10}$ Hz/Hz	Rubidium Oscillator
Field <sup>1</sup>	10 MHz	$2.8 \times 10^{-7}$ Hz/Hz	Agilent 53132A

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. Values listed with percent (%) are percent of reading or generated value unless otherwise noted.
3. L = Length in inches, D = the diagonal in inches
4. The uncertainties shown are for the most favorable conditions. There is an increase in uncertainty that corresponds to the laboratory's AC voltage and current uncertainties at different frequencies other than the ones shown. Power factors (PF) other than the one shown contribute to the power uncertainty. PF is related to the cosine of phase. Therefore, uncertainties track the laboratory's phase uncertainty closely at PF near one, but are magnified heavily as PF approaches zero. The lab may also report reactive power, apparent power, and power factor under this accreditation. If needed, contact laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.
5. The stated uncertainty is the laboratory's ability to source a fast rise pulse that is approximately 250 ps. In the typical application of measuring rise time of an oscilloscope, this value is one of the contributing factors, but other factors are derived from the DUT.
6. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.06.



Vice President

