CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

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

Fulfills the requirements of

ISO/IEC 17025:2017

and the national standards

ANSI/NCSL Z540-1-1994 (R2002) AND
ANSI/NCSL Z540.3-2006 (R2013)

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.

Jason Stine, Vice President

Expiry Date: 07 September 2027
Certificate Number: AC-2489.06

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)
ANSI/NCSL Z540.3-2006 (R2013)

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

ISO/IEC 17025 Accreditation Granted: **02 September 2025**

Certificate Number: **AC-2489.06** Certificate Expiry Date: **07 September 2027**

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters [5]	4 pH 7 pH 10 pH	0.012 pH 0.011 pH 0.012 pH	Comparison to Accredited Buffer Solutions
Conductivity Meters [5]	1 µS/cm 10 µS/cm 100 µS/cm 1 000 µS/cm 1 413 µS/cm 10 000 µS/cm 100 000 µS/cm 150 000 µS/cm 200 000 µS/cm	0.62 µS/cm 0.62 µS/cm 2.1 µS/cm 5.1 µS/cm 5.5 µS/cm 45 µS/cm 410 µS/cm 650 µS/cm 690 µS/cm	Comparison to Accredited Solutions

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	Up to 220 µA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 µA 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 (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz 220 mA to 2.2 A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.033 % of reading + 16 nA 0.019 % of reading + 10 nA 0.014 % of reading + 8 nA 0.029 % of reading + 10 nA 0.11 % of reading + 65 nA 0.031 % of reading + 40 nA 0.018 % of reading + 35 nA 0.012 % of reading + 35 nA 0.021 % of reading + 0.11 µA 0.11 % of reading + 0.65 µA 0.033 % of reading + 40 nA 0.02 % of reading + 0.35 µA 0.014 % of reading + 0.35 µA 0.022 % of reading + 0.55 µA 0.11 % of reading + 5 µA 0.04 % of reading + 4 µA 0.019 % of reading + 3.5 µA 0.012 % of reading + 2.5 µA 0.021 % of reading + 3.5 µA 0.11 % of reading + 10 µA 0.025 % of reading + 35 µA 0.045 % of reading + 80 µA 0.7 % of reading + 0.16 mA	Comparison to Fluke 5730A Multiproduct Calibrator
AC Current – Source [1]	(2.2 to 11) A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.047 % of reading + 0.17 mA 0.095 % of reading + 0.38 mA 0.36 % of reading + 0.75 mA	Comparison to Fluke 5730A Multiproduct Calibrator, Fluke 5725 Amplifier
AC Current – Source [1]	(11 to 20.5) A (10 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	 0.091 % of reading + 3.9 mA 0.12 % of reading + 3.9 mA 2.3 % of reading + 3.9 mA	Comparison to Fluke 5520A Multiproduct Calibrator
AC Current – Source [1] Extended Frequency Ranges	(10 to 30) kHz (29 to 330) µA (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA	 1.2 % of reading + 0.31 µA 0.78 % of reading + 0.47 µA 0.31 % of reading + 3.1 µA 0.31 % of reading + 0.16 mA	Comparison to Fluke 5520A Multiproduct Calibrator

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Electrical – DC/Low Frequency

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AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor [1]	(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	 0.34 % of reading + 30 mA 0.95 % of reading + 47 mA 0.38 % of reading + 0.12 A 1.2 % of reading + 0.22 A	Comparison to Fluke 5520A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
AC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor [1]	(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	 0.65 % of reading + 0.29 A 1.2 % of reading + 0.29 A 0.68 % of reading + 1 A 1.4 % of reading + 1.1 A	Comparison to Fluke 5520A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
AC Current – Measure [1]	Up to 100 µA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz 100 Hz to 5 kHz 100 µA to 1 mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (1 to 10) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (10 to 100) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 mA to 1 A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	 0.46 % of reading + 35 nA 0.17 % of reading + 35 nA 0.072 % of reading + 35 nA 0.072 % of reading + 35 nA 0.46 % of reading + 0.23 µA 0.17 % of reading + 0.23 µA 0.071 % of reading + 0.23 µA 0.038 % of reading + 0.23 µA 0.46 % of reading + 2.3 µA 0.17 % of reading + 2.3 µA 0.071 % of reading + 2.3 µA 0.038 % of reading + 2.3 µA 0.48 % of reading + 23 µA 0.17 % of reading + 23 µA 0.071 % of reading + 23 µA 0.037 % of reading + 23 µA 0.46 % of reading + 0.23 mA 0.19 % of reading + 0.23 mA 0.097 % of reading + 0.23 mA 0.12 % of reading + 0.23 mA	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter

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AC Current – Measure [1]	(1 to 100) A 50 Hz to 1 kHz	0.12 % of reading + 2.3 mA	Comparison to Ohms Labs CS-100 Current Shunt, Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC Current – Source [1]	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	45 µA/A + 7 nA 39 µA/A + 8 nA 39 µA/A + 46 nA 58 µA/A + 0.7 µA 0.24 mA/A + 12 µA	Comparison to Fluke 5730A Multiproduct Calibrator
DC Current – Source [1]	(2.2 to 11) A	0.4 mA/A + 0.48 mA	Comparison to Fluke 5730A Multiproduct Calibrator, Fluke 5725 Amplifier
DC Current – Source [1]	(11 to 20) A	0.084 % of reading + 0.58 mA	Comparison to Fluke 5520A Multiproduct Calibrator
DC Clamp-on Ammeter (Non-Toroidal Type) Hall Effect Sensor [1]	(20 to 150) A (150 to 1 000) A	0.58 % of reading + 0.16 A 0.59 % of reading + 0.58 A	Comparison to Fluke 5520A Multiproduct Calibrator, Fluke 5500A/Coil 50-turn Coil
DC Current – Measure [1]	Up to 100 µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	33 µA/A + 0.9 nA 29 µA/A + 5.8 nA 29 µA/A + 58 nA 46 µA/A + 0.58 µA 0.13 mA/A + 12 µA	Comparison to Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC Current – Measure [1]	(1 to 100) A	0.012 % of reading + 0.5 mA	Comparison to Ohms Labs CS-100 Current Shunt, Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC Current – Measure [1]	(100 to 650) A	0.31 % of reading + 10 mA	Comparison to Canadian Shunt Ind. Ltd. LC-1000-50 Current Shunt, Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC Resistance – Source [1] (Fixed Artifacts)	1 mΩ 10 mΩ 100 mΩ	0.16 mΩ/Ω 0.16 mΩ/Ω 0.16 mΩ/Ω	Comparison to Standard Resistors

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DC Resistance – Source [1] (Variable Artifact)	(1 to 10) GΩ (10 to 100) GΩ 100 GΩ to 1 TΩ	0.58 % of reading + 1.2 μΩ/Ω/V 1.2 % of reading + 2.3 μΩ/Ω/V 1.2 % of reading + 5.8 μΩ/Ω/V	Comparison to IET HRRS-B-7-100k-5kV Decade Resistor (V is the DUT Voltage)
DC Resistance – Source/Measure [1] (Fixed Artifacts)	Up to 25 Ω (25 to 400) Ω 400 Ω to 1 kΩ (1 to 40) kΩ	56 μΩ 2.1 μΩ/Ω 4.4 μΩ/Ω 10 μΩ/Ω	Comparison to Hart 1590 Super Thermometer, Reference Resistors
Resistance – Source/Measure [1] (Variable Artifacts)	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	18 μΩ/Ω + 58 μΩ 15 μΩ/Ω + 0.58 mΩ 13 μΩ/Ω + 0.58 mΩ 12 μΩ/Ω + 5.8 mΩ 13 μΩ/Ω + 58 mΩ 21 μΩ/Ω + 2.3 Ω 62 μΩ/Ω + 0.12 kΩ 0.059 % of reading + 1.2 kΩ 0.82 % of reading + 12 kΩ	Comparison to Agilent 3458A 8.5 Digit Multimeter, Decade Resistor
AC Voltage – Source [1]	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	 0.16 % of reading + 4 μV 0.1 % of reading + 4 μV 0.078 % of reading + 4 μV 0.13 % of reading + 4 μV 0.17 % of reading + 5 μV 0.33 % of reading + 10 μV 0.47 % of reading + 20 μV 0.58 % of reading + 20 μV 0.044 % of reading + 4 μV 0.031 % of reading + 4 μV 0.015 % of reading + 4 μV 0.031 % of reading + 4 μV 0.059 % of reading + 5 μV 0.12 % of reading + 10 μV 0.16 % of reading + 20 μV 0.3 % of reading + 20 μV	Comparison to Fluke 5730A Multiproduct Calibrator

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AC Voltage – Source [1]	(22 to 220) mV		Comparison to Fluke 5730A Multiproduct Calibrator
	(10 to 20) Hz	0.028 % of reading + 12 µV	
	(20 to 40) Hz	0.011 % of reading + 7 µV	
	40 Hz to 20 kHz	0.007 % of reading + 7 µV	
	(20 to 50) kHz	0.013 % of reading + 7 µV	
	(50 to 100) kHz	0.033 % of reading + 17 µV	
	(100 to 300) kHz	0.068 % of reading + 20 µV	
	(300 to 500) kHz	0.14 % of reading + 25 µV	
	500 kHz to 1 MHz	0.28 % of reading + 45 µV	
	220 mV to 2.2 V		
	(10 to 20) Hz	0.028 % of reading + 40 µV	
	(20 to 40) Hz	0.01 % of reading + 15 µV	
	40 Hz to 20 kHz	0.005 % of reading + 8 µV	
	(20 to 50) kHz	0.008 % of reading + 10 µV	
	(50 to 100) kHz	0.01 % of reading + 30 µV	
	(100 to 300) kHz	0.035 % of reading + 80 µV	
	(300 to 500) kHz	0.1 % of reading + 0.2 mV	
	500 kHz to 1 MHz	0.18 % of reading + 0.3 mV	
	(2.2 to 22) V		
	(10 to 20) Hz	0.028 % of reading + 0.4 mV	
	(20 to 40) Hz	0.01 % of reading + 0.15 mV	
	40 Hz to 20 kHz	0.005 % of reading + 50 µV	
	(20 to 50) kHz	0.008 % of reading + 0.1 mV	
	(50 to 100) kHz	0.008 % of reading + 0.2 mV	
	(100 to 300) kHz	0.03 % of reading + 0.6 mV	
	(300 to 500) kHz	0.1 % of reading + 2 mV	
	500 kHz to 1 MHz	0.17 % of reading + 3.2 mV	
AC Voltage – Source [1]	(22 to 220) V		Comparison to Fluke 5730A Multiproduct Calibrator, Fluke 5725A Amplifier
	(10 to 20) Hz	0.028 % of reading + 4 mV	
	(20 to 40) Hz	0.01 % of reading + 1.5 mV	
	40 Hz to 20 kHz	0.006 % of reading + 0.6 mV	
	(20 to 50) kHz	0.009 % of reading + 1 mV	
	(50 to 100) kHz	0.016 % of reading + 2.5 mV	
	(100 to 300) kHz	0.09 % of reading + 16 mV	
	(300 to 500) kHz	0.44 % of reading + 40 mV	
	500 kHz to 1 MHz	0.8 % of reading + 80 mV	

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AC Voltage – Source [1]	(220 to 750) V		Comparison to Fluke 5730A Multiproduct Calibrator, Fluke 5725A Amplifier
	(30 to 50) kHz	0.061 % of reading + 11 mV	
	(50 to 100) kHz	0.23 % of reading + 45 mV	
	(220 to 1 100) V		
	40 Hz to 1 kHz	0.011 % of reading + 4 mV	
	(1 to 20) kHz	0.017 % of reading + 6 mV	
	(20 to 30) kHz	0.061 % of reading + 11 mV	
AC Voltage – Measure [1]	Up to 10 mV		Comparison to Agilent 3458A 8.5 Digit Multimeter
	(1 to 40) Hz	0.04 % of reading + 3.5 µV	
	40 Hz to 1 kHz	0.03 % of reading + 1.2 µV	
	(1 to 20) kHz	0.04 % of reading + 1.2 µV	
	(20 to 50) kHz	0.15 % of reading + 1.2 µV	
	(50 to 100) kHz	0.59 % of reading + 1.2 µV	
	(100 to 300) kHz	4.6 % of reading + 2.3 µV	
	300 kHz to 1 MHz	1.5 % of reading + 5.8 µV	
	(1 to 4) MHz	8.1 % of reading + 8.1 µV	
	(10 to 100) mV		
	(1 to 40) Hz	0.013 % of reading + 4.6 µV	
	40 Hz to 1 kHz	0.009 7 % of reading + 2.3 µV	
	(1 to 20) kHz	0.017 % of reading + 2.3 µV	
	(20 to 50) kHz	0.038 % of reading + 2.3 µV	
	(50 to 100) kHz	0.093 % of reading + 2.3 µV	
	(100 to 300) kHz	0.36 % of reading + 12 µV	
	300 kHz to 1 MHz	1.2 % of reading + 12 µV	
	(1 to 2) MHz	1.8 % of reading + 12 µV	
	(2 to 4) MHz	4.7 % of reading + 81 µV	
	(4 to 8) MHz	4.7 % of reading + 92 µV	
	(8 to 10) MHz	17 % of reading + 0.12 mV	
	100 mV to 1 V		
	(1 to 40) Hz	0.008 8 % of reading + 46 µV	
	40 Hz to 1 kHz	0.008 3 % of reading + 23 µV	
	(1 to 20) kHz	0.017 % of reading + 23 µV	
	(20 to 50) kHz	0.036 % of reading + 23 µV	
	(50 to 100) kHz	0.093 % of reading + 23 µV	
	(100 to 300) kHz	0.35 % of reading + 0.12 mV	
	300 kHz to 1 MHz	1.2 % of reading + 0.12 mV	
	(1 to 2) MHz	1.8 % of reading + 0.12 mV	
	(2 to 4) MHz	4.6 % of reading + 0.81 mV	
	(4 to 8) MHz	4.6 % of reading + 0.92 mV	
	(8 to 10) MHz	17 % of reading + 1.2 mV	

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AC Voltage – Measure [1]	(1 to 10) V		Comparison to Agilent 3458A 8.5 Digit Multimeter
	(1 to 40) Hz	0.009 5 % of reading + 0.46 mV	
	40 Hz to 1 kHz	0.023 % of reading + 0.23 mV	
	(1 to 20) kHz	0.017 % of reading + 0.23 mV	
	(20 to 50) kHz	0.036 % of reading + 0.23 mV	
	(50 to 100) kHz	0.093 % of reading + 0.23 mV	
	(100 to 300) kHz	0.35 % of reading + 1.2 mV	
	300 kHz to 1 MHz	1.2 % of reading + 1.2 mV	
	(1 to 2) MHz	1.8 % of reading + 1.2 mV	
	(2 to 4) MHz	4.6 % of reading + 8.1 mV	
	(4 to 8) MHz	4.6 % of reading + 9.2 mV	
	(8 to 10) MHz	17 % of reading + 12 mV	
	(10 to 100) V		
	(1 to 40) Hz	0.024 % of reading + 4.6 mV	
	40 Hz to 1 kHz	0.024 % of reading + 2.3 mV	
	(1 to 20) kHz	0.024 % of reading + 2.3 mV	
	(20 to 50) kHz	0.041 % of reading + 2.3 mV	
	(50 to 100) kHz	0.14 % of reading + 2.3 mV	
	(100 to 300) kHz	0.46 % of reading + 12 mV	
	300 kHz to 1 MHz	1.7 % of reading + 12 mV	
	(100 to 700) V		
	(1 to 40) Hz	0.048 % of reading + 46 mV	
	40 Hz to 1 kHz	0.048 % of reading + 23 mV	
	(1 to 20) kHz	0.071 % of reading + 23 mV	
	(20 to 50) kHz	0.19 % of reading + 23 mV	
	(50 to 100) kHz	0.35 % of reading + 23 mV	
AC High Voltage – Measure [1]	700 V to 10 kV		Comparison to Vitrek 4700 Digital HV Meter
	(30 to 200) Hz	0.17 % of reading + 2.1 V	
	(200 to 450) Hz	0.47 % of reading + 2.1 V	
AC High Voltage – Measure [1]	(10 to 30) kV		Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVP-35 High Voltage Probe
	(30 to 200) Hz	0.13 % of reading + 37 V	
	(200 to 450) Hz	0.71 % of reading + 37 V	
AC High Voltage – Measure [1]	(30 to 50) kV		Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVL-70 High Voltage Probe
	(30 to 100) Hz	0.13 % of reading + 55 V	
	(100 to 200) Hz	0.7 % of reading + 55 V	

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AC High Voltage – Measure [1]	(50 to 75) kV (30 to 70) Hz (70 to 200) Hz	0.16 % of reading + 0.16 kV 1.2 % of reading + 0.16 kV	Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVL-100 High Voltage Probe
DC Voltage – Source [1]	Up to 220 µV 220 µV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V	9.1 µV/V + 0.4 µV 5.7 µV/V + 0.7 µV 4.4 µV/V + 2.5 µV 4 µV/V + 4 µV 6.3 µV/V + 40 µV	Comparison to Fluke 5730A Multiproduct Calibrator
DC Voltage – Source [1]	(220 to 1 100) V	7.6 µV/V + 0.4 mV	Comparison to Fluke 5730A Multiproduct Calibrator, Fluke 5725A Amplifier
DC Voltage – Measure [1]	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 500) V (500 to 800) V (800 to 1 000) V	8.3 µV/V + 0.58 µV 5.3 µV/V + 0.58 µV 5.3 µV/V + 0.58 µV 7.7 µV/V + 35 µV 15 µV/V + 0.12 mV 18 µV/V + 0.12 mV 21 µV/V + 0.12 mV	Comparison to Agilent 3458A 8.5 Digit Multimeter
DC High Voltage – Measure [1]	(1 to 10) kV	0.036 % of reading + 2.1 V	Comparison to Vitrek 4700 Digital HV Meter
DC High Voltage – Measure [1]	(10 to 35) kV	0.041 % of reading + 37 V	Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVP-35 High Voltage Probe
DC High Voltage – Measure [1]	(35 to 70) kV	0.038 % of reading + 55 V	Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVL-70 High Voltage Probe
DC High Voltage – Measure [1]	(70 to 100) kV	0.063 % of reading + 0.16 kV	Comparison to Vitrek 4700 Digital HV Meter, Vitrek HVL-100 High Voltage Probe

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Capacitance – Source [1] (Simulation)	10 Hz to 10 kHz 190 pF to 1.1 nF 10 Hz to 3 kHz (1.1 to 3.3) nF 10 Hz to 1 kHz (3.3 to 11) nF (11 to 33) nF (33 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 (10 to 80) Hz (33 to 110) µF DC to 50 Hz (110 to 330) µF DC to 20 Hz 330 µF to 1.1 mF DC to 6 Hz (1.1 to 3.3) mF DC to 2 Hz (3.3 to 11) mF DC to 600 mHz (11 to 33) mF DC to 200 mHz (33 to 110) mF	 0.4 % of reading + 7.8 pF 0.4 % of reading + 7.8 pF 0.22 % of reading + 7.8 pF 0.22 % of reading + 78 pF 0.22 % of reading + 78 pF 0.22 % of reading + 0.23 nF 0.22 % of reading + 0.78 nF 0.22 % of reading + 2.3 nF 0.22 % of reading + 7.8 nF 0.33 % of reading + 23 nF 0.42 % of reading + 78 µF 0.42 % of reading + 0.23 µF 0.36 % of reading + 0.78 µF 0.35 % of reading + 2.3 µF 0.35 % of reading + 7.8 µF 0.58 % of reading + 23 µF 0.85 % of reading + 78 µF	Comparison to Fluke 5520A Multiproduct Calibrator
Electrical Simulation of Thermocouple Indicating Devices – Measure/Source [1]	Type B (250 to 350) °C (350 to 445) °C (445 to 580) °C (580 to 750) °C (750 to 1 000) °C (1 000 to 1 820) °C	 1.2 °C 0.9 °C 0.71 °C 0.55 °C 0.45 °C 0.35 °C	Comparison to Ectron 1140A Thermocouple Calibrator/Simulator

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Electrical Simulation of Thermocouple Indicating Devices – Measure/Source [1]	Type C		Comparison to Ectron 1140A Thermocouple Calibrator/Simulator
	(0 to 250) °C	0.24 °C	
	(250 to 1 000) °C	0.19 °C	
	(1 000 to 1 500) °C	0.21 °C	
	(1 500 to 1 800) °C	0.24 °C	
	(1 800 to 2 000) °C	0.27 °C	
	(2 000 to 2 250) °C	0.33 °C	
	(2 250 to 2 315) °C	0.37 °C	
	Type E		
	(-270 to -245) °C	1.6 °C	
	(-245 to -195) °C	0.24 °C	
	(-195 to -155) °C	0.12 °C	
	(-155 to -90) °C	0.09 °C	
	(-90 to 0) °C	0.08 °C	
	(0 to 15) °C	0.08 °C	
	(15 to 890) °C	0.06 °C	
	(890 to 1 000) °C	0.07 °C	
	Type J		
	(-210 to -180) °C	0.15 °C	
	(-180 to -120) °C	0.12 °C	
	(-120 to -50) °C	0.09 °C	
	(-50 to 990) °C	0.08 °C	
	(990 to 1 200) °C	0.09 °C	
	Type K		
	(-270 to -255) °C	2.5 °C	
	(-255 to -195) °C	0.85 °C	
	(-195 to -115) °C	0.16 °C	
	(-115 to -55) °C	0.12 °C	
	(-55 to 1 000) °C	0.09 °C	
	(1 000 to 1 372) °C	0.1 °C	
	Type N		
	(-270 to -260) °C	5.4 °C	
	(-260 to -200) °C	1.5 °C	
	(-200 to -140) °C	0.29 °C	
	(-140 to -70) °C	0.18 °C	
	(-70 to 25) °C	0.14 °C	
	(-25 to 160) °C	0.12 °C	
	(160 to 1 300) °C	0.11 °C	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Measure/Source [1]	Type R (-50 to -30) °C (-30 to 45) °C (45 to 160) °C (160 to 380) °C (380 to 775) °C (775 to 1 768) °C Type S (-50 to -30) °C (-30 to 45) °C (45 to 105) °C (105 to 310) °C (310 to 615) °C (615 to 1 768) °C Type T (-270 to -255) °C (-255 to -240) °C (-240 to -210) °C (-210 to -150) °C (-150 to -40) °C (-40 to 100) °C (100 to 400) °C	 0.8 °C 0.69 °C 0.49 °C 0.35 °C 0.3 °C 0.26 °C 0.76 °C 0.68 °C 0.49 °C 0.41 °C 0.35 °C 0.31 °C 1.9 °C 0.6 °C 0.36 °C 0.22 °C 0.15 °C 0.09 °C 0.08 °C	Comparison to Ectron 1140A Thermocouple Calibrator/Simulator
DC Power – Source [1] 330 µW to 330 mA 330 mA to 3 A (3 to 20.5) A	 11 µW to 1.1 mW (1.1 to 110) mW 110 mW to 110 W (110 to 330) W 11 µW to 110 mW 110 mW to 990 W 990 W to 3 kW 99 mW to 0.99 W 0.99 W to 6.8 kW (6.8 to 20.5) kW	 0.024 % of reading 0.027 % of reading 0.024 % of reading 0.018 % of reading 0.044 % of reading 0.053 % of reading 0.01 % of reading 0.088 % of reading 0.07 % of reading 0.04 % of reading	Comparison to Fluke 5520A Multiproduct Calibrator

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source [1,2]			Comparison to Fluke 5520A Multiproduct Calibrator
PF = 1			
(3.3 to 9) mA	(10 to 65) Hz		
	110 µW to 3 mW	0.13 % of reading	
	3 mW to 9 W	0.077 % of reading	
(9 to 33) mA	(10 to 65) W		
	300 µW to 10 mW	0.089 % of reading	
	10 mW to 33 W	0.077 % of reading	
(33 to 90) mA	(10 to 65) Hz		
	(1 to 30) mW	0.071 % of reading	
	30 mW to 90 W	0.057 % of reading	
(90 to 330) mA	(10 to 65) Hz		
	(3 to 100) mW	0.089 % of reading	
	100 mW to 300 W	0.078 % of reading	
(330 to 900) mA	(10 to 65) Hz		
	(11 to 300) mW	0.071 % of reading	
	300 mW to 900 W	0.081 % of reading	
900 mA to 2.2 A	(10 to 65) Hz		
	(30 to 720) mW	0.089 % of reading	
	0.72 W to 2 kW	0.079 % of reading	
(2.2 to 4.5) A	(10 to 65) Hz		
	80 mW to 1.4 W	0.088 % of reading	
	1.4 W to 4.5 kW	0.18 % of reading	
(4.5 to 20.5) A	(10 to 65) Hz		
	150 mW to 20kW	0.17 % of reading	
Phase – Source [1]	Up to 180°		Comparison to Fluke 5520A Multiproduct Calibrator
	(10 to 65) Hz	0.11°	
	(65 to 500) Hz	0.2°	
	500 Hz to 1 kHz	0.4°	
	(1 to 5) kHz	1.9°	
	(5 to 10) kHz	3.9°	
	(10 to 20) kHz	7.8°	
Oscilloscopes [1,3]			Comparison to Fluke 5520A/11 Multiproduct Calibrator with 1.1 GHz Scope Option
Amplitude – DC			
into 50 Ω load	(-6 to 6) V	0.2 % of reading + 31 µV	
into 1 MΩ load	(-130 to 130) V	0.04 % of reading + 31 µV	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1,3]			
Amplitude – Square Wave			
into 50 Ω load	10 Hz to 100 kHz		
	1 mVp-p to 6.6 Vp-p	0.19 % of reading + 31 µV	
into 1 MΩ load	10 Hz to 1 kHz		
	1 mVp-p to 6.6 Vp-p	0.08 % of reading + 31 µV	
	(1 kHz to 10) kHz		
	1 mVp-p to 6.6 Vp-p	0.19 % of reading + 31 µV	
Time Markers			
into 50 Ω load	1 ns to 20 ms	0.000 22 % of reading	
	50 ms	0.005 9 % of reading	
	0.1 s	0.009 8 % of reading	
	0.2 s	0.018 % of reading	
	0.5 s	0.041 % of reading	Comparison to Fluke 5520A/11 Multiproduct Calibrator with 1.1 GHz Scope Option
	1 s	0.08 % of reading	
	2 s	0.16 % of reading	
	5 s	0.39 % of reading	
Rise Time			
into 50 Ω load	5 mVp-p to 2.5 Vp-p		
Rate: 1 kHz to 2 MHz	250 ps (nominal)	50 ps	
Rate: 2 MHz to 10 MHz	250 ps (nominal)	50 ps	
Leveled Sine Wave			
into 50 Ω load	5 mVp-p to 5 Vp-p		
	50 kHz	1.8 % of reading + 0.23 mV	
	50 kHz to 100 MHz	2.8 % of reading + 0.23 mV	
	(100 to 300) MHz	3.2 % of reading + 0.23 mV	
	(300 to 600) MHz	4 % of reading + 0.23 mV	
	5 mVp-p to 3.5 Vp-p		
	600 MHz to 1.1 GHz	5.5 % of reading + 0.2 mV	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1,3]			Comparison to Fluke 5520A/11 Multiproduct Calibrator with 1.1 GHz Scope Option
Bandwidth/Flatness (50 kHz Reference)			
into 50 Ω load	5 mVp-p to 5.5 Vp-p		
	50 kHz to 100 MHz	1.4 % of reading + 78 µV	
	(100 to 300) MHz	1.8 % of reading + 78 µV	
	(300 to 600) MHz	3.2 % of reading + 78 µV	
	5 mVp-p to 3.5 Vp-p		
	600 MHz to 1.1 GHz	4 % of reading + 78 µV	
Input Impedance – Measure	(40 to 60) Ω	0.082 % of reading	
	500 kΩ to 1.5 MΩ	0.081 % of reading	
Input Capacitance – Measure	(5 to 50) pF	3.9 % of reading + 0.39 pF	
Waveform Generator (Sine, Square, Triangle)			
Amplitude	10 Hz to 10 kHz		
into 50 Ω load	1.8 mVp-p to 2.5 Vp-p	2.3 % of reading + 78 µV	
into 1 MΩ load	1.8 mVp-p to 55 Vp-p	2.3 % of reading + 78 µV	
Frequency	10 Hz to 10 kHz	0.002 % of reading + 12 mHz	
Electrical Simulation of pH Indicating Devices [1,7]	4 pH	0.000 061 pH	Comparison to Fluke 5520A Multiproduct Calibrator
	7 pH	0.000 013 pH	
	10 pH	0.000 061 pH	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Angle – Source [1,4]	Up to 75°	6.6″	Comparison to Angle Blocks
	90°	2.7″	Master Square
Angle – Measure [1]	Up to 360°	0.25°	Direct measure using Digital Protractor
Gage Blocks [4] (Steel and Chrome)	(0.01 to 1) in	3.3 µin	Comparison to Gage Block Comparator, Master Gage Blocks
	(1 to 4) in	(1.7 + 1.4*L*) µin	

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Long Gage Blocks [4] (Steel Only)	(4 to 20) in	(5.5 + 1.4*L*) µin	Comparison to Gage Block Comparator, Master Gage Blocks
Calipers, Micrometers [1,4] Travel (Outside, Inside, Depth, Step)	Up to 0.4 in (0.4 to 1) in (1 to 4) in (4 to 40) in	(8 + 1*L*) µin (7 + 2*L*) µin (4+ 5*L*) µin (8 + 5*L*) µin	Comparisons to Gage Blocks
Anvil Flatness	Up to 1 in diameter	6.4 µin	Optical Flats
Anvil Parallelism	Up to 1 in diameter	11 µin	Optical Parallels
Indicators [1,4] (Dial, Digital, Drop, Snap)	Up to 1 in (1 to 4) in (4 to 24) in	(31 + 0.3*L*) µin (29 + 3*L*) µin (25 + 4*L*) µin	Comparison to Gage Blocks, Amplifier
Test Indicators	Up to 0.05 in	6.1 µin	Comparison to Universal Length Measuring Machine
Height Gages [1,4]	Up to 1 in (1 to 4) in (4 to 24) in	(31 + 0.3*L*) µin (29 + 3*L*) µin (25 + 4*L*) µin	Comparison to Gage Blocks, Amplifier
Height Masters, Caliper Masters, 1-2-3 Blocks, Parallels [1,4]	Up to 4 in (4 to 24) in	(52 + 0.5*L*) µin (41 + 3.7*L*) µin	Comparison to Gage Blocks, Amplifier
Length – Single Axis [4] Outside Dimension	Up to 1 in (1 to 7) in (7 to 12) in	(6 + 1.3*L*) µin (4.5 + 4*L*) µin (2 + 4*L*) µin	Comparison to Universal Length Measuring Machine
Inside Dimension	(0.04 to 0.125) in (0.125 to 0.25) in (0.25 to 1) in (1 to 2.5) in (2.5 to 10) in (10 to 14) in	11 µin 11 µin 11 µin 18 µin (18 + 3*L*) µin (39 + 3*L*) µin	
Cylindrical Plugs	Up to 1 in (1 to 7) in	12 µin (11 + 3*L*) µin	Comparison to Universal Length Measuring Machine

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Cylindrical Rings [4]	(0.04 to 0.125) in (0.125 to 0.25) in (0.25 to 1) in (1 to 2.5) in (2.5 to 10) in (10 to 14) in	11 µin 11 µin 11 µin 18 µin (18 + 3*L*) µin (39 + 3*L*) µin	Comparison to Universal Length Measuring Machine
Thread Wires (2 to 120) TPI	(0.008 33 to 0.5) in	12 µin	Comparison to Universal Length Measuring Machine
Thread Plug Gages [4] Pitch Diameter – 60 ° Thread Major Diameter	Up to 1 in (1 to 4) in (4 to 7) in Up to 1 in (1 to 7) in	79 µin 81 µin 84 µin 13 µin (10 + 3*L*) µin	Comparison to Universal Length Measuring Machine, Master Thread Wires
Thread Ring Gages Inner Pitch Diameter	Up to 1 in (1 to 4) in (4 to 7) in	79 µin 81 µin 84 µin	Comparison to Master Thread Setting Plug Uncertainty
Surface Plates [1,4] Overall Flatness Local Area Flatness (Repeat Readings)	 (17 to 100) in*DL* Up to 0.001 in	 (24 + √*DL*) µin 33 µin	In accordance with ASME B89.3.7 using Electronic Level System Supramess with Repeat-o-Meter
Optical Comparators [1,4] X-Y Length Squareness Magnification	 Up to 12 in (0.04 to 0.5) in (0.5 to 1) in 10X to 50X	 (80 + 19*L*) µin (110 + 1*L*) µin (112 + 1.5*L*) µin (240 + 21*L*) µin	Comparisons to Calibration Grids Calibration Grids Magnification Scale, Reticle
Flatness, Straightness, Parallelism [1]	Up to 18 in	36 µin	Comparison to Gage Amplifier, Surface Plate

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Optical Flats/Parallels Flatness Parallelism	 Up to 3 in Up to 2 in	 2.7 µin 2.8 µin	Comparison to Master Optical Flat, Universal Length Measuring Machine

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Viscosity Cups [5] (Kinematic Viscosity)	18 mm^2/s (cSt) 32 mm^2/s (cSt) 65 mm^2/s (cSt) 117 mm^2/s (cSt) 230 mm^2/s (cSt) 392 mm^2/s (cSt) 734 mm^2/s (cSt)	0.57 % of reading 0.78 % of reading 0.62 % of reading 0.75 % of reading 0.91 % of reading 1.1 % of reading 0.82 % of reading	Comparison to Accredited Viscosity Standards (Nominal at 25°C)
Force Gages – Tension/Compression	(0.1 to 200) lbf	0.033 % of reading	Comparison to NIST Class F Weights
Mass Determination (Metric)	0.5 kg 1 kg 2 kg 5 kg 10 kg 20 kg 30 kg	11 mg 11 mg 15 mg 22 mg 0.2 g 0.3 g 0.3 g	Single Substitution Method using Master Weights and Electronic Balances.
Mass Determination (Avoirdupois)	1 lb 2 lb 3 lb 5 lb 10 lb 20 lb 30 lb 50 lb 65 lb	10 mg 10 mg 10 mg 10 mg 20 mg 0.2 g 0.2 g 0.2 g 0.3 g	Single Substitution Method using Master Weights and Electronic Balances.

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales [1,6] (Metric)	Up to 500 mg (0.5 to 10) g (10 to 30) g (30 to 50) g (50 to 200) g (200 to 500) g (0.5 to 5) kg (5 to 25) kg	4.7 µg 20 µg 40 µg 75 µg 0.22 mg 0.62 mg 3.7 mg 61 mg	ASTM E617 Class 1 & Class 2 weights and internal calibration procedure utilized for the calibration of the weighing system.
Balances and Scales [1,6] (Avoirdupois)	(0.5 to 500) lb	0.033 % of reading	NIST Class F weights and internal calibration procedure utilized for the calibration of the weighing system.
Rockwell Hardness Testers [1]	HRC Low Middle High HRBW Low Middle High	 0.45 HRC 0.45 HRC 0.34 HRC 0.56 HRBW 0.47 HRBW 0.53 HRBW	Indirect verification per ASTM E18 using Test Blocks
Pressure – Absolute [1]	(0 to 30) psia (30 to 300) psia (300 to 1 000) psia	0.002 6 psi 0.008 9 % of reading 0.01 % of reading	Comparison to DHI RPM4 Pressure Calibrator, Pressure Controller
Pressure – Hydraulic [1]	(200 to 1 600) psig (1 600 to 16 200) psig	0.091 psi 0.006 % of reading	Comparison to Fluke P3125-PSI Deadweight Tester
Pressure – Pneumatic [1]	(-15 to 30) psig (30 to 300) psi (300 to 1 000) psig	0.002 2 psi 0.007 5 % of reading 0.01 % of reading	Comparison to DHI RPM4 Pressure Calibrator, Pressure Controller
Pressure – Pneumatic [1]	(-60 to -22) inH_2O (-22 to 22) inH_2O (22 to 60) inH_2O	0.01 % of reading 0.002 2 inH_2O 0.01 % of reading	Comparison to DHI PPC4 Pressure Controller
Pressure – Pneumatic [1]	(22 to 60) inH_2O (60 to 72) inH_2O (72 to 832) inH_2O	0.01 % of reading 0.006 7 inH_2O 0.01 % of reading	Comparison to DHI PPC4 Pressure Controller

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Measuring Equipment [1]	(0.2 lbf·in to 5) lbf·in	1.7 % of reading + 0.002 3 lbf·in	Comparison to Tohnichi TDT60CN3-G Digital Torque Driver Tester
Torque Measuring Equipment [1]	(2 to 50) lbf·in	1.4 % of reading + 0.006 lbf·in	Comparison to Tohnichi TDT600CN3-G Digital Torque Driver Tester
Torque Measuring Equipment [1]	(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	0.46 % of reading 0.46 % of reading 0.46 % of reading 0.46 % of reading 0.48 % of reading	Comparison to CDI Torque Calibration System
Torque Calibration Systems	(2.5 to 50) lbf·in (4.2 to 250) lbf·ft (250 to 800) lbf·ft	0.2 % of reading 0.2 % of reading 0.2 % of reading	Comparison to Torque Wheels, Torque Arm, NIST Class F Weights

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity – Measure [1]	(-10 to 15) °C Up to 95 %RH (15 to 25) °C (0 to 90) %RH (90 to 95) %RH (25 to 40) °C Up to 50 %RH (50 to 75) %RH (75 to 95) %RH	 2.1 %RH 1.3 %RH 2 %RH 1.7 %RH 2 %RH 2.3 %RH	Direct measure using Thermohygrometer

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Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity – Source	(-10 to 15) °C (10 to 75) %RH (75 to 95) %RH (15 to 35) °C (10 to 95) %RH (35 to 70) °C (10 to 50) %RH (50 to 70) %RH (70 to 95) %RH	 0.5 %RH 0.65 %RH 0.5 %RH 0.5 %RH 0.7 %RH 0.85 %RH	Comparison to Humidity Generator
Temperature – Measure [1]	(-100 to 0.01) °C (0.01 to 230) °C (230 to 420) °C (420 to 660) °C	11 mK 19 mK 25 mK 36 mK	Direct measure using PRT, Precision Indicator
Temperature – Measure [1]	(600 to 980) °C	0.87 % of reading + 1 °C	Direct measure using Type K Thermocouple Probe, Thermocouple Indicator
Thermocouple Probe, RTD, PRT, Thermistor	(-80 to -40) ºC (-40 to 100) ºC (100 to 270) ºC (270 to 400) ºC	1.9 mK 1.4 mK 2.4 mK 5.6 mK	Comparison to Precision Bath, SPRT
Thermocouple Probe, RTD, PRT, Thermistor	(400 to 600) °C	22 mK	Comparison to Furnace, SPRT
Infrared Temperature Measuring Devices	(-15 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 120) °C (120 to 200) °C (200 to 350) °C (350 to 500) °C	0.8 °C 0.65 °C 0.7 °C 0.76 °C 0.95 °C 1.6 °C 2.1 °C	Comparison to Black Body (flat plate) ε = (0.9 to 1), λ = (8 to 14) µm
SPRT/PRT Calibration by Fixed Point	0.01 °C	0.6 mK	Comparison to TPW Cell
	156.598 ºC	1.9 mK	Comparison to In Cell
	231.928 ºC	2.1 mK	Comparison to Sn Cell
	419.527 ºC	3.5 mK	Comparison to Zn Cell

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Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
SPRT/PRT Calibration by Fixed Point	660.323 ºC	8.6 mK	Comparison to Al Cell
SPRT/PRT Calibration by Comparison	-195 °C	2.4 mK	Comparison to Hart 5681 SPRT, $NBPLN_2$
SPRT/PRT Calibration by Comparison	-80 °C -38.8 °C	1.9 mK 1.2 mK	Comparison to Hart 5681 SPRT, Precision Bath

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Rise Time – Measure [1]	≥ 5 ns	4 ns	Comparison to Agilent DSO5012 Digital Oscilloscope
Frequency – Reference	10 MHz	5.9 mHz	Comparison to Stanford Research FS725 Rubidium Frequency Standard
Frequency – Measure [1]	1 Hz to 10 kHz 10 kHz to 10 MHz 10 MHz to 225 MHz	0.64 nHz/Hz + 4.5 µHz 0.64 nH/Hz + 5 µHz 0.64 nHz/Hz	Comparison to Agilent 53132A Universal Counter, Characterized with Stanford Research FS725 Rubidium Frequency Standard
Frequency – Source [1]	1 Hz to 80 MHz	58 nHz/Hz	Comparison to Agilent 33250A Arbitrary Waveform Generator characterized with Stanford Research FS725 Rubidium Frequency Standard

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Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Period – Measure [1]	(1 to 100) s	45 µs	Comparison to Comparison to Agilent 53132A Universal Counter, Characterized with Stanford Research FS725 Rubidium Frequency Standard
Period – Source [1]	(1 to 100) s	58 ns/s	Comparison to Agilent 33250A Arbitrary Waveform Generator characterized with Stanford Research FS725 Rubidium Frequency Standard
Non-contact Rate of Rotation [1,4]	(5 to 100) rpm (100 to 1 000) rpm (1 000 to 10 000) rpm (10 000 to 100 000) rpm (100 000 to 200 000) rpm	0.012 % of reading + 0.001 2 rpm 0.012 % of reading + 0.012 rpm 0.012 % of reading + 0.12 rpm 0.014 % of reading + 1.2 rpm 0.014 % of reading + 12 rpm	Comparison to MasterNon-contact/Laser Tachometer
Stopwatches, Timers	Up to 599 s/mon	58 ms/d	Comparison to Helmut Klein/Vibrograf TM-4500 Timometer
AC Duty Cycle – Source [1] Square Wave: < 3.3 Vp-p Freq: 0.1 Hz to 100 kHz	(1 to 10) % Duty Cycle 10 µs to 100 s (10 to 49) % Duty Cycle 10 µs to 100 s 50 % Duty Cycle 10 µs to 100 s (51 to 90) % Duty Cycle 10 µs to 100 s (90 to 99) % Duty Cycle 10 µs to 100 s	 0.039 % of reading + 78 ns 0.62 % of reading + 78 ns 0.001 6 % of reading + 78 ns 0.62 % of reading + 78 ns 0.039 % of reading + 78 ns	Comparison to Fluke 5522A Multiproduct Calibrator

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.

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2. 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.
3. 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.
4. *L* = length in inches; *DL* = diagonal length in inches; ″ = arc-second; rpm = revolutions per minute.
5. These numbers are nominal in nature. Uncertainty will reflect actual values reported.
6. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
7. The CMC for pH simulation is calculated assuming the unit under test requires a slope of 59.16 mV per pH.
8. Unless otherwise specified in the far-right column, the calibration method/procedure utilized by the laboratory was developed internally.
9. Transcat-Dayton is a part of the legal entity of Transcat, Inc.

Jason Stine, Vice President

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