



# CERTIFICATE OF ACCREDITATION

**The ANSI National Accreditation Board**

Hereby attests that

**Transcat - St. Louis**

**895 Bolger Court  
Fenton, MO 63026**

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](http://www.anab.org).

Jason Stine, Vice President

Expiry Date: 07 September 2025  
Certificate Number: AC-2489.13



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 – St. Louis**

895 Bolger Court

Fenton, MO 63026

Dennis Evans 636-349-7722

**CALIBRATION**

Valid to: **September 7, 2025**

Certificate Number: **AC-2489.13**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure <sup>1</sup>	Up to 100 $\mu$ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	33 $\mu$ A/A + 0.92 nA 29 $\mu$ A/A + 5.8 nA 29 $\mu$ A/A + 58 nA 46 $\mu$ A/A + 0.58 $\mu$ A 0.013 % of reading + 12 $\mu$ A	8.5 Digit Multimeter
DC Current – Measure <sup>1</sup>	(1 to 3) A	0.096 % of reading + 0.47 mA	6.5 Digit Multimeter
DC Current – Source <sup>1</sup>	Up to 330 $\mu$ A (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1 to 3) A (3 to 11) A (11 to 20.5) A	0.12 mA/A + 16 nA 82 $\mu$ A/A + 39 nA 98 $\mu$ A/A + 0.19 $\mu$ A 78 $\mu$ A/A + 1.9 $\mu$ A 0.16 mA/A + 31 $\mu$ A 0.3 mA/A + 31 $\mu$ A 0.51 mA/A + 0.39 mA 0.93 mA/A + 0.58 mA	Multiproduct Calibrator
DC Clamp-on Ammeter <sup>1</sup> (Non-Toroidal Type) Hall Effect Sensor	(20 to 150) A (150 to 1 000) A	0.51 % of reading + 0.14 A 0.51 % of reading + 0.5 A	Multiproduct Calibrator, 50-turn Coil



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Electrical – DC/Low Frequency

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AC Current – Measure <sup>1</sup>	Up to 100 $\mu$ A		8.5 Digit Multimeter
	(10 to 20) Hz	0.46 % of reading + 35 nA	
	(20 to 45) Hz	0.17 % of reading + 35 nA	
	(45 to 100) Hz	0.072 % of reading + 35 nA	
	100 Hz to 1 kHz	0.072 % of reading + 35 nA	
	(0.1 to 1) mA		
	(10 to 20) Hz	0.46 % of reading + 0.23 $\mu$ A	
	(20 to 45) Hz	0.17 % of reading + 0.23 $\mu$ A	
	(45 to 100) Hz	0.07 % of reading + 0.23 $\mu$ A	
	100 Hz to 5 kHz	0.038 % of reading + 0.23 $\mu$ A	
	(1 to 10) mA		
	(10 to 20) Hz	0.46 % of reading + 2.3 $\mu$ A	
	(20 to 45) Hz	0.17 % of reading + 2.3 $\mu$ A	
	(45 to 100) Hz	0.071 % of reading + 2.3 $\mu$ A	
	100 Hz to 5 kHz	0.038 % of reading + 2.3 $\mu$ A	
(10 to 100) mA			
(10 to 20) Hz	0.46 % of reading + 23 $\mu$ A		
(20 to 45) Hz	0.17 % of reading + 23 $\mu$ A		
(45 to 100) Hz	0.071 % of reading + 23 $\mu$ A		
100 Hz to 5 kHz	0.037 % of reading + 23 $\mu$ A		
100 mA to 1 A			
(10 to 20) Hz	0.46 % of reading + 0.23 mA		
(20 to 45) Hz	0.19 % of reading + 0.23 mA		
(45 to 100) Hz	0.097 % of reading + 0.23 mA		
100 Hz to 5 kHz	0.12 % of reading + 0.23 mA		
AC Current – Source <sup>1</sup>	(29 to 330) $\mu$ A		Multiproduct Calibrator
	(10 to 20) Hz	0.16 % of reading + 80 nA	
	(20 to 45) Hz	0.12 % of reading + 80 nA	
	45 Hz to 1 kHz	0.097 % of reading + 80 nA	
	(1 to 5) kHz	0.23 % of reading + 0.12 $\mu$ A	
	(5 to 10) kHz	0.62 % of reading + 0.16 $\mu$ A	
	(10 to 30) kHz	1.2 % of reading + 0.31 $\mu$ A	
	330 $\mu$ A to 3.3 mA		
	(10 to 20) Hz	0.16 % of reading + 0.12 $\mu$ A	
	(20 to 45) Hz	0.097 % of reading + 0.12 $\mu$ A	
	45 Hz to 1 kHz	0.078 % of reading + 0.12 $\mu$ A	
	(1 to 5) kHz	0.16 % of reading + 0.16 $\mu$ A	
(5 to 10) kHz	0.39 % of reading + 0.23 $\mu$ A		
(10 to 30) kHz	0.78 % of reading + 0.47 $\mu$ A		



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Electrical – DC/Low Frequency

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AC Current – Source <sup>1</sup>	(3.3 to 33) mA		Multiproduct Calibrator
	(10 to 20) Hz	0.14 % of reading + 1.6 $\mu$ A	
	(20 to 45) Hz	0.071 % of reading + 1.6 $\mu$ A	
	45 Hz to 1 kHz	0.035 % of reading + 1.6 $\mu$ A	
	(1 to 5) kHz	0.064 % of reading + 1.6 $\mu$ A	
	(5 to 10) kHz	0.16 % of reading + 2.3 $\mu$ A	
	(10 to 30) kHz	0.31 % of reading + 3.1 $\mu$ A	
	(33 to 330) mA		
	(10 to 20) Hz	0.14 % of reading + 16 $\mu$ A	
	(20 to 45) Hz	0.071 % of reading + 16 $\mu$ A	
	45 Hz to 1 kHz	0.033 % of reading + 16 $\mu$ A	
	(1 to 5) kHz	0.078 % of reading + 39 $\mu$ A	
	(5 to 10) kHz	0.16 % of reading + 78 $\mu$ A	
	(10 to 30) kHz	0.31 % of reading + 0.16 mA	
	330 mA to 1.1 A		
	(10 to 20) Hz	0.14 % of reading + 78 $\mu$ A	
	45 Hz to 1 kHz	0.04 % of reading + 78 $\mu$ A	
	(1 to 5) kHz	0.47 % of reading + 0.78 mA	
	(5 to 10) kHz	1.9 % of reading + 3.9 mA	
	(1.1 to 3) A		
(10 to 20) Hz	0.14 % of reading + 78 $\mu$ A		
45 Hz to 1 kHz	0.049 % of reading + 78 $\mu$ A		
(1 to 5) kHz	0.47 % of reading + 0.78 mA		
(5 to 10) kHz	1.9 % of reading + 3.9 mA		
(3 to 11) A			
(10 to 100) Hz	0.049 % of reading + 1.6 mA		
100 Hz to 1 kHz	0.079 % of reading + 1.6 mA		
(1 to 5) kHz	2.3 % of reading + 1.6 mA		
(11 to 20.5) A			
(10 to 100) Hz	0.095 % of reading + 3.9 mA		
100 Hz to 1 kHz	0.12 % of reading + 3.9 mA		
(1 to 5) kHz	2.3 % of reading + 3.9 mA		
AC Clamp-on Ammeters <sup>1</sup> (Toroidal Type) Transformer Type Sensor	(20 to 150) A		Multiproduct Calibrator, 50-turn Coil
	(45 to 65) Hz	0.3 % of reading + 26 mA	
	(65 to 440) Hz	0.83 % of reading + 47 mA	
	(150 to 1 000) A		
(45 to 65) Hz	0.35 % of reading + 0.12 A		
(65 to 440) Hz	1.1 % of reading + 0.22 A		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Clamp-on Ammeters <sup>1</sup> (Non-Toroidal Type) Hall Effect Sensor	(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	0.57 % of reading + 0.25 A 1 % of reading + 0.25 A  0.6 % of reading + 0.9 A 1.3 % of reading + 0.92 A	Multiproduct Calibrator, 50-turn Coil
DC Resistance – Source/Measure <sup>1</sup> (Variable Artifact)	Up to 10 Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 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	8.5 Digit Multimeter, Decade Resistor
DC Resistance – Source <sup>1</sup> (Variable Artifact)	(100 to 1 000) kΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1 000) MΩ (1 to 10) GΩ (10 to 100) GΩ (100 to 1 000) GΩ	0.037% of reading 0.037 % of reading + 1.2 μΩ/Ω/V 0.12 % of reading + 1.2 μΩ/Ω/V 0.23 % of reading + 1.2 μΩ/Ω/V 0.59 % of reading + 1.2 μΩ/Ω/V 1.2 % of reading + 1.2 μΩ/Ω/V 1.2 % of reading + 1.2 μΩ/Ω/V	High Accuracy Decade Resistor
DC Voltage – Measure <sup>1</sup>	Up to 100 mV (0.1 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	8.5 Digit Multimeter
DC High Voltage – Measure <sup>1</sup>	(1 to 10) kV (10 to 20) kV (20 to 30) kV (30 to 40) kV (40 to 50) kV (50 to 60) kV (60 to 70) kV (70 to 80) kV (80 to 90) kV (90 to 100) kV	0.039 % of reading + 92 mV 0.038 % of reading + 2.4 V 0.041 % of reading + 2.4 V 0.047 % of reading + 2.4 V 0.056 % of reading + 2.4 V 0.071 % of reading + 2.4 V 0.089 % of reading + 2.4 V 0.12 % of reading + 2.5 V 0.15 % of reading + 2.5 V 0.17 % of reading + 2.5 V	Digital HV Meter, Associated High Voltage Probes



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source <sup>1</sup>	(0 to 330) mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (300 to 1 000) V	16 $\mu$ V/V + 0.78 $\mu$ V 9 $\mu$ V/V + 1.6 $\mu$ V 10 $\mu$ V/V + 16 $\mu$ V 15 $\mu$ V/V + 0.12 mV 14 $\mu$ V/V + 1.2 mV	Multiproduct Calibrator
AC Voltage – Measure <sup>1</sup>	Up to 10 mV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz 1 MHz to 4 MHz (10 to 100) mV (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz (0.1 to 1) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz	0.04 % of reading + 3.5 $\mu$ V 0.03 % of reading + 1.2 $\mu$ V 0.04 % of reading + 1.2 $\mu$ V 0.15 % of reading + 1.2 $\mu$ V 0.59 % of reading + 1.2 $\mu$ V 4.6 % of reading + 2.3 $\mu$ V 1.5 % of reading + 5.8 $\mu$ V 8.1 % of reading + 8.1 $\mu$ V 0.013 % of reading + 4.6 $\mu$ V 0.009 7 % of reading + 2.3 $\mu$ V 0.017 % of reading + 2.3 $\mu$ V 0.038 % of reading + 2.3 $\mu$ V 0.093 % of reading + 2.3 $\mu$ V 0.36 % of reading + 12 $\mu$ V 1.2 % of reading + 12 $\mu$ V 1.8 % of reading + 12 $\mu$ V 4.7 % of reading + 81 $\mu$ V 4.7 % of reading + 92 $\mu$ V 17 % of reading + 0.12 mV 0.008 8 % of reading + 46 $\mu$ V 0.008 3 % of reading + 23 $\mu$ V 0.017 % of reading + 23 $\mu$ V 0.036 % of reading + 23 $\mu$ V 0.093 % of reading + 23 $\mu$ V 0.35 % of reading + 0.12 mV 1.2 % of reading + 0.12 mV 1.8 % of reading + 0.12 mV 4.6 % of reading + 0.81 mV 4.6 % of reading + 0.92 mV 17 % of reading + 1.2 mV	8.5 Digit Multimeter



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure <sup>1</sup>	(1 to 10) V		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	
	40Hz 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		
AC High Voltage – Measure <sup>1</sup>	(100 to 700) V		Digital HV Meter, Associated High Voltage Probes
	(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	
(0.7 to 5) kV			
10 mHz to 10 Hz	0.14 % of reading + 0.17 V		
(10 to 30) Hz	0.12 % of reading + 0.29 V		
(30 to 50) Hz	0.099 % of reading + 0.37 V		
(50 to 70) Hz	0.068 % of reading + 0.37 V		
(70 to 100) Hz	0.099 % of reading + 0.37 V		
(100 to 200) Hz	0.099 % of reading + 0.37 V		
(200 to 450) Hz	0.48 % of reading + 0.17 V		
(450 to 600) Hz	0.47 % of reading + 0.17 V		



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC High Voltage – Measure <sup>1</sup>	(5 to 30) kV		Digital HV Meter, Associated High Voltage Probes
	10 mHz to 10 Hz	0.19 % of reading + 2.4 V	
	(10 to 30) Hz	0.13 % of reading + 2.4 V	
	(30 to 50) Hz	0.11 % of reading + 2.4 V	
	(50 to 70) Hz	0.077 % of reading + 2.4 V	
	(70 to 100) Hz	0.11 % of reading + 2.4 V	
	(100 to 200) Hz	0.11 % of reading + 2.4 V	
	(200 to 450) Hz	0.7 % of reading + 2.4 V	
	(450 to 600) Hz	1.4 % of reading + 2.4 V	
	(30 to 50) kV		
	10 mHz to 10 Hz	0.24 % of reading + 2.5 V	
	(10 to 30) Hz	0.18 % of reading + 2.5 V	
	(30 to 50) Hz	0.13 % of reading + 2.5 V	
	(50 to 70) Hz	0.1 % of reading + 2.5 V	
	(70 to 100) Hz	0.13 % of reading + 2.5 V	
	(100 to 200) Hz	0.69 % of reading + 2.5 V	
	(200 to 450) Hz	2.9 % of reading + 2.5 V	
	(50 to 70) kV		
10 mHz to 10 Hz	0.37 % of reading + 2.6 V		
(10 to 30) Hz	0.26 % of reading + 2.6 V		
(30 to 50) Hz	0.16 % of reading + 2.6 V		
(50 to 70) Hz	0.16 % of reading + 2.6 V		
(70 to 100) Hz	1.2 % of reading + 2.6 V		
(100 to 200) Hz	1.2 % of reading + 2.6 V		
(200 to 450) Hz	17 % of reading + 2.6 V		
AC Voltage – Source <sup>1</sup>	(1 to 33) mV		Multiproduct Calibrator
	10 Hz to 45 Hz	0.065 % of reading + 4.7 μV	
	45 Hz to 10 kHz	0.014 % of reading + 4.7 μV	
	(10 to 20) kHz	0.017 % of reading + 4.7 μV	
	(20 to 50) kHz	0.079 % of reading + 4.7 μV	
	(50 to 100) kHz	0.27 % of reading + 9.3 μV	
	(100 to 500) kHz	0.62 % of reading + 39 μV	
	(33 to 330) mV		
	10 Hz to 45 Hz	0.027 % of reading + 6.2 μV	
	45 Hz to 10 kHz	0.012 % of reading + 6.2 μV	
	(10 to 20) kHz	0.013 % of reading + 6.2 μV	
	(20 to 50) kHz	0.027 % of reading + 6.2 μV	
(50 to 100) kHz	0.062 % of reading + 25 μV		
(100 to 500) kHz	0.16 % of reading + 54 μV		



**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source <sup>1</sup>	(0.33 to 3.3) V 10 Hz to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (3.3 to 33) V 10 Hz to 45 Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (33 to 330) V 45 Hz to 1 kHz 1 kHz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (330 to 1020) V 45 Hz to 1 kHz 1 kHz to 5 kHz (5 to 10) kHz	0.027 % of reading + 39 μV 0.012 % of reading + 47 μV 0.015 % of reading + 47 μV 0.024 % of reading + 39 μV 0.055 % of reading + 49 μV 0.19 % of reading + 0.47 mV 0.027 % of reading + 0.50 mV 0.012 % of reading + 0.47 mV 0.019 % of reading + 0.47 mV 0.027 % of reading + 0.47 mV 0.7 % of reading + 1.2 mV 0.015 % of reading + 1.6 mV 0.016 % of reading + 4.7 mV 0.020 % of reading + 4.7 mV 0.025 % of reading + 4.7 mV 0.16 % of reading + 39 mV 0.023 % of reading + 7.8 mV 0.02 % of reading + 7.8 mV 0.023 % of reading + 7.8 mV	Multiproduct Calibrator
Capacitance – Source <sup>1</sup> (Simulation)	10 Hz to 10 kHz (0.22 to 0.399 9) nF (0.4 to 1.09 99) nF 10 Hz to 3 kHz (1.1 to 3.299 9) nF 10 Hz to 1 kHz (3.3 to 10.999 9) nF (11 to 32.999 9) nF (33 to 109.999) nF (110 to 329.999) nF 10 Hz to 600 Hz (0.33 to 1.099 9) μF 10 Hz to 300 Hz (1.1 to 3.299 99) μF	0.39 % of reading + 7.8 pF 0.39 % of reading + 7.8 pF 0.39 % of reading + 7.8 pF 0.39 % of reading + 7.8 pF 0.21 % of reading + 7.8 pF 0.21 % of reading + 78 pF 0.21 % of reading + 78 pF 0.21 % of reading + 0.23 nF 0.21 % of reading + 0.78 nF 0.21 % of reading + 2.3 nF	Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source <sup>1</sup> (Simulation)	10 Hz to 150 Hz (3.3 to 10.999 9) $\mu$ F 10 Hz to 120 Hz (11 to 32.999 9) $\mu$ F 10 Hz to 80 Hz (33 to 109.999) $\mu$ F DC to 50 Hz (110 to 329.999) $\mu$ F DC to 20 Hz (0.33 to 10.999 9) mF DC to 6 Hz (1.1 to 3.299 99) mF DC to 2 Hz (3.3 to 10.999 9) mF DC to 0.6 Hz (11 to 32.999 9) mF DC to 0.2 Hz (33 to 110) mF	0.21 % of reading + 7.8 nF 0.32 % of reading + 23 nF 0.35 % of reading + 78 nF 0.35 % of reading + 0.23 $\mu$ F 0.35 % of reading + 0.78 $\mu$ F 0.35 % of reading + 2.3 $\mu$ F 0.35 % of reading + 7.8 $\mu$ F 0.58 % of reading + 23 $\mu$ F 0.85 % of reading + 78 $\mu$ F	Multiproduct Calibrator
Capacitance – Measure <sup>1</sup> (1 kHz)	1 pF to 1 nF (1 to 10) nF (10 to 100) nF (0.1 to 1) $\mu$ F (1 to 10) $\mu$ F (10 to 100) $\mu$ F (0.1 to 1) mF (1 to 10) mF (10 to 100) mF	1.9% of reading + 19 pF 0.83 % of reading + 39 pF 0.83 % of Reading + 0.39 nF 0.83 % of reading + 3.9 nF 0.82 % of Reading + 39 nF 0.9 % of reading + 0.39 $\mu$ F 0.89 % of reading + 3.9 $\mu$ F 0.89 % of reading + 39 $\mu$ F 3.2 % of reading + 0.16 mF	6.5 Digit Multimeter
Electrical Simulation of Thermocouple Indicating Devices – Measure/Source <sup>1</sup>	Type B (250 to 350) $^{\circ}$ C (350 to 445) $^{\circ}$ C (445 to 580) $^{\circ}$ C (580 to 750) $^{\circ}$ C (750 to 1 000) $^{\circ}$ C (1 000 to 1 820) $^{\circ}$ C	1.2 $^{\circ}$ C 0.9 $^{\circ}$ C 0.71 $^{\circ}$ C 0.55 $^{\circ}$ C 0.45 $^{\circ}$ C 0.35 $^{\circ}$ C	Ectron 1140A Thermocouple Calibrator/Simulator

**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 <sup>1</sup>	Type E		Ectron 1140A Thermocouple Calibrator/Simulator
	(-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	0.095 °C	
	(-90 to 0) °C	0.08 °C	
	(0 to 15) °C	0.076 °C	
	(15 to 890) °C	0.064 °C	
	(890 to 1 000) °C	0.074 °C	
	Type J		
	(-210 to -180) °C	0.15 °C	
	(-180 to -120) °C	0.12 °C	
	(-120 to -50) °C	0.093 °C	
	(-50 to 990) °C	0.08 °C	
	(990 to 1 200) °C	0.094 °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	0.087 °C	
	(1 000 to 1 372) °C	0.096 °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		
Type R			
(-50 to -30) °C	0.8 °C		
(-30 to 45) °C	0.69 °C		
(45 to 160) °C	0.49 °C		
(160 to 380) °C	0.35 °C		
(380 to 775) °C	0.3 °C		
(775 to 1 768) °C	0.26 °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 <sup>1</sup>	Type S		Ectron 1140A Thermocouple Calibrator/Simulator	
	(-50 to -30) °C	0.76 °C		
	(-30 to 45) °C	0.68 °C		
	(45 to 105) °C	0.49 °C		
	(105 to 310) °C	0.41 °C		
	(310 to 615) °C	0.35 °C		
	(615 to 1 768) °C	0.31 °C		
	Type T			
	(-270 to -255) °C	1.9 °C		
	(-255 to -240) °C	0.6 °C		
	(-240 to -210) °C	0.36 °C		
	(-210 to -150) °C	0.22 °C		
	(-150 to -40) °C	0.15 °C		
(-40 to 100) °C	0.095 °C			
(100 to 400) °C	0.08 °C			
Oscilloscopes <sup>1,2</sup>	Amplitude – DC Voltage into 50 Ω load into 1 MΩ load	(-6 to 6) V	0.22 % of reading + 31 μV	Multiproduct Calibrator with 1.1 GHz Scope Option
		(-130 to 130) V	0.12 % of reading + 31 μV	
	Amplitude – Square Wave into 50 Ω load	10 Hz to 10 kHz 1 mV p-p to 6.6 Vp-p	22 % of reading + 31 μV	
		into 1 MΩ load	10 Hz to 1 kHz 1 mV p-p to 130 Vp-p (1 kHz to 10) kHz 1 mV p-p to 130 Vp-p	
	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	
		1 s	0.08 % of reading	
		2 s	0.16 % of reading	
		5 s	0.39 % of reading	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes <sup>1,2</sup> Rise Time – Source into 50 Ω load Rate: 1 kHz to 2 MHz Rate: 2 MHz to 10 MHz	5 mVp-p to 2.5 Vp-p (200 to 300) ps (250 to 350) ps	50 ps 50 ps	Multiproduct Calibrator with 1.1 GHz Scope Option
Leveled Sine Wave into 50 Ω load	5 mVp-p to 5 Vp-p 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5 mVp-p to 3.5 Vp-p 600 MHz to 1.1 GHz	1.8 % of reading + 0.23 mV 2.8 % of reading + 0.23 mV 3.2 % of reading + 0.23 mV 4.7 % of reading + 0.23 mV 5.5 % of reading + 0.23 mV	
Bandwidth/Flatness (50 kHz Reference) into 50 Ω load	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5 mVp-p to 3.5 Vp-p (600 to 1 100) MHz	1.4 % of reading + 78 μV 1.8 % of reading + 78 μV 3.2 % of reading + 78 μV 3.9 % of reading + 78 μV	
Input Impedance – Measure	(40 to 60) Ω 500 kΩ to 1.5 MΩ	0.082 % of reading 0.081 % of reading	
Input Capacitance – Measure	(5 to 50) pF	3.9 % of reading + 0.39 pF	
Waveform Generator (Sine, Square, Triangle) Amplitude into 50 Ω load into 1 MΩ load	10 Hz to 10 kHz 1.8 mVp-p to 2.5 Vp-p 1.8 mVp-p to 55 Vp-p	2.3 % of reading + 78 μV 2.3 % of reading + 78 μV	
Frequency	10 Hz to 10 kHz	0.001 9 % of reading + 12 mHz	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
LF Phase – Source <sup>1</sup>	(0 to 180)° (10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) kHz	0.11° 0.21° 0.39° 1.9° 3.9° 7.8°	Multiproduct Calibrator
DC Power – Source <sup>1</sup> (0.33 to 330) mA (0.33 to 3) A (3 to 20.5) A	(11 to 330) μW 11 W to 3 kW 99 mW to 20.9 kW	0.018 % of reading 0.017 % of reading 0.054 % of reading	Multiproduct Calibrator
AC Power – Source <sup>1,3</sup> PF = 1 3.3 mA to 3 A 3.3 mA to 20.5 A 33 mA to 3 A 33 mA to 20.5 A (3 to 20.5) A	(10 to 45) Hz 0.11 mW to 99 W (45 to 65) Hz 0.11 mW to 20.9 kW (65 to 500) Hz 11 mW to 3.06 kW 500 Hz to 1 kHz 11 mW to 20.9 kW (65 to 500) Hz 9.9 W to 20.9 kW	0.18 % of reading 0.14 % of reading 0.16 % of reading 0.16 % of reading 0.16 % of reading	Multiproduct Calibrator

**Length – Dimensional Metrology**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers and Calipers <sup>1,4</sup> (Outside, Inside, Depth, Step)	(0.05 to 1) in (1 to 12) in	(13 + 1L) μin (7 + 5L) μin	Gage Blocks, Long Gage Blocks
Anvil Flatness <sup>1</sup>	Up to 1 in	6.3 μin	Optical Flats
Indicators <sup>1,4</sup> (Dial and Digital)	Up to 1 in (1 to 6) in	(10 + 2L) μin (4 + 10L) μin	Gage Blocks
Distance Measuring Equipment <sup>4</sup>	Up to 99 999 ft	(0.05 + 0.000 5D) ft	Cylinder with Square Ends with Incremental Counter



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**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales <sup>1,5</sup>	Up to 5 g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g (200 to 500) g 500 g to 1 kg (1 to 2) kg (2 to 3) kg	40 µg 59 µg 89 µg 0.15 mg 0.31 mg 0.9 mg 1.5 mg 3.1 mg 4.4 mg 4.8 mg	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
Torque – Measure <sup>1</sup> (Dial, Digital, Click Wrenches)	(4 to 500) lbf·in (30 to 400) lbf·in (80 to 1 000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft	0.61 % of reading 0.61 % of reading 0.61 % of reading 0.61 % of reading 0.71 % of reading	Torque Calibration System
Absolute Pressure Measuring Devices <sup>1</sup> (Pneumatic)	(0 to 14.7) psia (14.7 to 39.7) psia (39.7 to 514.7) psia	0.002 5 psi 0.000 71 % of reading + 0.002 3 psi 0.006 5 % of reading	Pneumatic Pressure Controller/Calibrator
Gauge Pressure Measuring Devices <sup>1</sup> (Pneumatic)	(-14.2 to < 0) psig (> 0 to 25) psig (25 to 500) psig (-36 to -22) inH <sub>2</sub> O (-22 to 22) inH <sub>2</sub> O (22 to 60) inH <sub>2</sub> O (60 to 72) inH <sub>2</sub> O (72 to 804) inH <sub>2</sub> O	0.000 64 % of reading + 0.001 3 psi 0.001 4 % of reading + 0.001 3 psi 0.006 7 % of reading 0.009 % of reading + 0.000 15 inH <sub>2</sub> O 0.002 inH <sub>2</sub> O 0.009 % of reading + 0.000 15 inH <sub>2</sub> O 0.006 5 inH <sub>2</sub> O 0.009 % of reading + 0.000 15 inH <sub>2</sub> O	Pneumatic Pressure Controller/Calibrator
Gauge Pressure Measuring Devices, Pressure Controllers/Calibrators <sup>1</sup> (Hydraulic)	(5 to 150) psig (150 to 1 500) psig (50 to 1 500) psig (1 500 to 15 000) psig	0.032 psi 0.008 % of reading + 0.02 psi 0.14 psi 0.008 % of reading + 0.02 psi	Deadweight Tester

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Drywell Calibrators, Liquid Baths <sup>1</sup>	(-195 to 0) °C (0 to 160) °C (160 to 420) °C (420 to 660) °C	0.015 °C 0.015 °C 0.02 °C 0.032 °C	SPRT, Digital Temperature Indicator

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Digital/Mechanical Thermometers, RTD Probes, Thermocouple Probes, Thermistors <sup>1</sup>	(-30 to -20) °C	0.041 °C	Micro-Bath, SPRT, Digital Temperature Indicator
Digital/Mechanical Thermometers, RTD Probes, Thermocouple Probes, Thermistors <sup>1</sup>	(-20 to 25) °C (25 to 150) °C	0.018 °C 0.021 °C	Liquid Bath, SPRT, Digital Temperature Indicator
Digital/Mechanical Thermometers, RTD Probes, Thermocouple Probes, Thermistors <sup>1</sup>	(150 to 160) °C (160 to 300) °C (300 to 600) °C	0.061 °C 0.14 °C 0.52 °C	Dry-well, SPRT, Digital Temperature Indicator

**Time and Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Reference	10 MHz	0.59 nHz/Hz	Rubidium Frequency Standard
Frequency – Measure <sup>1</sup>	1 to 10 kHz 10 kHz to 10 MHz 10 MHz to 225 MHz	0.64 fHz/Hz + 4.5 µHz 0.64 fHz/Hz + 5 µHz 0.64 fHz/Hz	Frequency Counter, Rubidium Frequency Standard
Frequency – Source <sup>1</sup>	1 Hz to 20 MHz	58 nHz/Hz	Function Generator, Rubidium Frequency Standard

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. 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.
  3. 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 the laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.
  4.  $L$  = length in inches;  $D$  = Distance in feet.
  5. 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.
  6. The legal entity for this client is Transcat, Inc.
  7. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.13.



Jason Stine, Vice President

