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.

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)

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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 [1]	Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	33 µA/A + 0.92 nA 29 µA/A + 5.8 nA 29 µA/A + 58 nA 46 µA/A + 0.58 µA 0.013 % of reading + 12 µA	8.5 Digit Multimeter
DC Current – Measure [1]	(1 to 3) A	0.096 % of reading + 0.47 mA	6.5 Digit Multimeter
DC Current – Source [1]	Up to 330 µA (0.33 to 3.3) mA (3.3 to 33) mA (33 to330) 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 µA/A + 39 nA 98 µA/A + 0.19 µA 78 µA/A + 1.9 µA 0.16 mA/A + 31 µA 0.3 mA/A + 31 µA 0.51 mA/A + 0.39 mA 0.93 mA/A + 0.58 mA	Multiproduct Calibrator
DC Clamp-on Ammeter [1] (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

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure [1]	Up to 100 µA		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 µA	
	(20 to 45) Hz	0.17 % of reading + 0.23 µA	
	(45 to 100) Hz	0.07 % of reading + 0.23 µA	
	100 Hz to 5 kHz	0.038 % of reading + 0.23 µA	
	(1 to 10) mA		
	(10 to 20) Hz	0.46 % of reading + 2.3 µA	
	(20 to 45) Hz	0.17 % of reading + 2.3 µA	
	(45 to 100) Hz	0.071 % of reading + 2.3 µA	
	100 Hz to 5 kHz	0.038 % of reading + 2.3 µA	
	(10 to 100) mA		
	(10 to 20) Hz	0.46 % of reading + 23 µA	
	(20 to 45) Hz	0.17 % of reading + 23 µA	
	(45 to 100) Hz	0.071 % of reading + 23 µA	
	100 Hz to 5 kHz	0.037 % of reading + 23 µA	
	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 [1]	(29 to 330) µA		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 µA	
	(5 to 10) kHz	0.62 % of reading + 0.16 µA	
	(10 to 30) kHz	1.2 % of reading + 0.31 µA	
	330 µA to 3.3 mA		
	(10 to 20) Hz	0.16 % of reading + 0.12 µA	
	(20 to 45) Hz	0.097 % of reading + 0.12 µA	
	45 Hz to 1 kHz	0.078 % of reading + 0.12 µA	
	(1 to 5) kHz	0.16 % of reading + 0.16 µA	
	(5 to 10) kHz	0.39 % of reading + 0.23 µA	
	(10 to 30) kHz	0.78 % of reading + 0.47 µA	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	(3.3 to 33) mA		Multiproduct Calibrator
	(10 to 20) Hz	0.14 % of reading + 1.6 µA	
	(20 to 45) Hz	0.071 % of reading + 1.6 µA	
	45 Hz to 1 kHz	0.035 % of reading + 1.6 µA	
	(1 to 5) kHz	0.064 % of reading + 1.6 µA	
	(5 to 10) kHz	0.16 % of reading + 2.3 µA	
	(10 to 30) kHz	0.31 % of reading + 3.1 µA	
	(33 to 330) mA		
	(10 to 20) Hz	0.14 % of reading + 16 µA	
	(20 to 45) Hz	0.071 % of reading + 16 µA	
	45 Hz to 1 kHz	0.033 % of reading + 16 µA	
	(1 to 5) kHz	0.078 % of reading + 39 µA	
	(5 to 10) kHz	0.16 % of reading + 78 µA	
	(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 µA	
	45 Hz to 1 kHz	0.04 % of reading + 78 µA	
	(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 µA	
	45 Hz to 1 kHz	0.049 % of reading + 78 µA	
	(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 [1] (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	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Clamp-on Ammeters [1] (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 [1] (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 [1] (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 [1]	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 [1]	(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

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source [1]	(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 µV/V + 0.78 µV 9 µV/V + 1.6 µV 10 µV/V + 16 µV 15 µV/V + 0.12 mV 14 µV/V + 1.2 mV	Multiproduct Calibrator
AC Voltage – Measure [1]	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 µV 0.03 % of reading + 1.2 µV 0.04 % of reading + 1.2 µV 0.15 % of reading + 1.2 µV 0.59 % of reading + 1.2 µV 4.6 % of reading + 2.3 µV 1.5 % of reading + 5.8 µV 8.1 % of reading + 8.1 µV 0.013 % of reading + 4.6 µV 0.009 7 % of reading + 2.3 µV 0.017 % of reading + 2.3 µV 0.038 % of reading + 2.3 µV 0.093 % of reading + 2.3 µV 0.36 % of reading + 12 µV 1.2 % of reading + 12 µV 1.8 % of reading + 12 µV 4.7 % of reading + 81 µV 4.7 % of reading + 92 µV 17 % of reading + 0.12 mV 0.008 8 % of reading + 46 µV 0.008 3 % of reading + 23 µV 0.017 % of reading + 23 µV 0.036 % of reading + 23 µV 0.093 % of reading + 23 µV 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

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure [1]	(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	
	(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]	(0.7 to 5) kV		Digital HV Meter, Associated High Voltage Probes
	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	

Electrical – DC/Low Frequency

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

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source [1] (Simulation)	10 Hz to 150 Hz (3.3 to 10.999 9) µF 10 Hz to 120 Hz (11 to 32.999 9) µF 10 Hz to 80 Hz (33 to 109.999) µF DC to 50 Hz (110 to 329.999) µF 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 µF 0.35 % 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	Multiproduct Calibrator
Capacitance – Measure [1] (1 kHz)	1 pF to 1 nF (1 to 10) nF (10 to 100) nF (0.1 to 1) µF (1 to 10) µF (10 to 100) µF (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 µF 0.89 % of reading + 3.9 µF 0.89 % of reading + 39 µF 3.2 % of reading + 0.16 mF	6.5 Digit Multimeter
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	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 [1]	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) °	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	

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 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	 0.76 °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 0.095 °C 0.08 °C	Ectron 1140A Thermocouple Calibrator/Simulator
Oscilloscopes [1,2] Amplitude – DC Voltage into 50 Ω load into 1 MΩ load Amplitude – Square Wave into 50 Ω load into 1 MΩ load Time Markers into 50 Ω load	 (-6 to 6) V (-130 to 130) V 10 Hz to 10 kHz 1 mV p-p to 6.6 Vp-p 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 1 ns to 20 ms 50 ms 0.1 s 0.2 s 0.5 s 1 s 2 s 5 s	 0.22 % of reading + 31 µV 0.12 % of reading + 31 µV 22 % of reading + 31 µV 0.14 % of reading + 31 µV 0.22 % of reading + 31 µV 0.000 22 % of reading 0.005 9 % of reading 0.009 8 % of reading 0.018 % of reading 0.041 % of reading 0.08 % of reading 0.16 % of reading 0.39 % of reading	Multiproduct Calibrator with 1.1 GHz Scope Option

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1,2]			Multiproduct Calibrator with 1.1 GHz Scope Option
Rise Time – Source			
into 50 Ω load	5 mVp-p to 2.5 Vp-p		
Rate: 1 kHz to 2 MHz	(200 to 300) ps	50 ps	
Rate: 2 MHz to 10 MHz	(250 to 350) ps	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	4.7 % of reading + 0.23 mV	
	5 mVp-p to 3.5 Vp-p		
	600 MHz to 1.1 GHz	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	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 to 1 100) MHz	3.9 % 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	0.001 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 [1]	Up 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 [1] (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 [1,3] 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 [1,4] (Outside, Inside, Depth, Step)	(0.05 to 1) in (1 to 12) in	(13 + 1*L*) µin (7 + 5*L*) µin	Gage Blocks, Long Gage Blocks
Anvil Flatness [1]	Up to 1 in	6.3 µin	Optical Flats
Indicators [1,4] (Dial and Digital)	Up to 1 in (1 to 6) in	(10 + 2*L*) µin (4 + 10*L*) µin	Gage Blocks
Distance Measuring Equipment [4]	Up to 99 999 ft	(0.05 + 0.000 5*D*) ft	Cylinder with Square Ends with Incremental Counter

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales [1,5]	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 [1] (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 [1] (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 [1] (Pneumatic)	(-14.2 to < 0) psig (> 0 to 25) psig (25 to 500) psig (-36 to -22) inH_2O (-22 to 22) inH_2O (22 to 60) inH_2O (60 to 72) inH_2O (72 to 804) inH_2O	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_2O 0.002 inH_2O 0.009 % of reading + 0.000 15 inH_2O 0.006 5 inH_2O 0.009 % of reading + 0.000 15 inH_2O	Pneumatic Pressure Controller/Calibrator
Gauge Pressure Measuring Devices, Pressure Controllers/Calibrators [1] (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 [1]	(-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 [1]	(-30 to -20) °C	0.041 °C	Micro-Bath, SPRT, Digital Temperature Indicator
	(-20 to 25) °C (25 to 150) °C	0.018 °C 0.021 °C	Liquid Bath, SPRT, Digital Temperature Indicator
	(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 – Source/Measure	10 MHz	5.9 nHz/Hz	Rubidium Frequency Standard
Frequency – Measure [1]	1 to 10 kHz 10 kHz to 10 MHz 10 MHz to 225 MHz	640 pHz/Hz + 4.5 µHz 640 pHz/Hz + 5.0 µHz 640 pHz/Hz	Frequency Counter, Rubidium Frequency Standard
Frequency – Source [1]	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.

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