CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat – San Juan
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San Juan, PR 00920

Fulfills the requirements of

ISO/IEC 17025:2017

and 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.
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Jason Stine, Vice President

Expiry Date: 07 September 2027
Certificate Number: AC-2489.05

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

ISO/IEC 17025 Accreditation Granted: **21 April 2025**

Certificate Number: **AC-2489.05** Certificate Expiry Date: **07 September 2027**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source [1]	(29 to 330) µA		Comparison to Fluke 5520A 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 + 0.12 µA	
	(1 to 5) kHz	0.23 % of reading + 0.16 µA	
	(5 to 10) kHz	0.62 % of reading + 0.16 µA	
	(10 to 30) kHz	1.2 % of reading + 0.31 µA	
	(0.33 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	

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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]	(3.3 to 33) mA		Comparison to Fluke 5520A 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	
	(0.33 to 1.1) A		
	(10 to 45) 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 + 4 mA	
	(1.1 to 3) A		
	(10 to 45) 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) A		
	(10 to 100) Hz	0.095 % of reading + 3.9 mA	
	100 Hz to 1 kHz	0.11 % of reading + 3.9 mA	
	(1 to 5) kHz	2.3 % of reading + 3.9 mA	
AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor [1]	(20 to 150) A		Comparison to Fluke 5520A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
	(45 to 65) Hz	0.24 % of reading + 19 mA	
	(65 to 440) Hz	0.62 % of reading + 21 mA	
	(150 to 1 025) A		
	(45 to 65) Hz	0.24 % of reading + 70 mA	
	(65 to 440) Hz	0.61 % of reading + 78 mA	

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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 1 025) A (45 to 65) Hz (65 to 440) Hz	 0.5 % of reading + 0.19 A 0.9 % of reading + 0.19 A 0.52 % of reading + 0.7 A 0.9 % of reading + 0.7 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 to 100) Hz 100 Hz to 5 kHz (0.1 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
DC Current – Source [1]	Up to 330 µA (0.33 to 3.3) mA (3.3 to 33) mA (33 to 330) mA (0.33 to 1.1) A (1.1 to 3) A (3 to 11) A (11 to 20) A	0.012 % of reading + 16 nA 0.008 2 % of reading + 39 nA 0.009 8 % of reading + 0.19 µA 0.007 8 % of reading + 1.9 µA 0.016 % of reading + 31 µA 0.03 % of reading + 31 µA 0.051 % of reading + 0.39 mA 0.093 % of reading + 0.58 mA	Comparison to Fluke 5520A Multiproduct Calibrator

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Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Clamp-on Ammeter (Non-Toroidal Type) Hall Effect Sensor [1]	(20 to 55) A (55 to 150) A (150 to 550) A (550 to 1 025) A	0.47 % of reading + 0.11 A 0.41 % of reading + 0.11 A 0.45 % of reading + 0.39 A 0.51 % of reading + 0.39 A	Comparison to Fluke 5520A Multiproduct Calibrator, Fluke 5500A/Coil 50-turn Coil
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 0.13 % of reading + 12 µA	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
DC Resistance – Source [1] (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (0.33 to 1.1) GΩ	32 µΩ/Ω + 0.78 mΩ 24 µΩ/Ω + 1.2 mΩ 22 µΩ/Ω + 1.1 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 0.16 Ω 22 µΩ/Ω + 0.16 Ω 27 µΩ/Ω + 1.6 Ω 26 µΩ/Ω + 1.6 Ω 66 µΩ/Ω + 23 Ω 0.1 mΩ/Ω + 39 Ω 0.19 mΩ/Ω + 1.9 kΩ 0.41 mΩ/Ω + 2.3 kΩ 0.23 % of reading + 78 kΩ 1.2 % of reading + 0.39 MΩ	Comparison to Fluke 5520A Multiproduct Calibrator
DC Resistance – Source [1] (Variable Artifact)	(100 to 200) kΩ (300 to 700) kΩ (0.8 to 1) MΩ (1 to 10) MΩ (20 to 100) MΩ (200 to 900) MΩ (1 to 9) GΩ (10 to 90) GΩ (0.1 to 1) TΩ	0.036 % of reading 0.036 % of reading + 100 Ω 0.036 % of reading + 200 Ω 0.035 % of reading + 1.2 µΩ/V 0.12 % of reading + 1.2 µΩ/V 0.3 % of reading + 1.2 µΩ/V 0.58 % of reading + 1.2 µΩ/V 1.2 % of reading + 2.3 µΩ/V 1.2 % of reading + 5.8 µΩ/V	Comparison to IET High Resistance Decade Substituter
DC Resistance – Source [1] (Artifact)	10 GΩ 100 GΩ	63 MΩ 1.3 GΩ	Comparison to Decade Resistance Standard

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DC Resistance – Measure [1]	Up to 10 Ω	18 μΩ/Ω + 58 μΩ	Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
	(10 to 100) Ω	15 μΩ/Ω + 0.58 mΩ	
	(0.1 to 1) kΩ	13 μΩ/Ω + 0.58 mΩ	
	(1 to 10) kΩ	12 μΩ/Ω + 5.8 mΩ	
	(10 to 100) kΩ	13 μΩ/Ω + 58 mΩ	
	(0.1 to 1) MΩ	21 μΩ/Ω + 2.3 Ω	
	(1 to 10) MΩ	62 μΩ/Ω + 0.12 kΩ	
	(10 to 100) MΩ	0.059 % of reading + 1.2 kΩ	
	(0.1 to 1) GΩ	0.82 % of reading + 12 kΩ	
AC Voltage – Source [1]	(1 to 33) mV		Comparison to Fluke 5520A Multiproduct Calibrator
	(10 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 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	
	(0.33 to 3.3) V		
	(10 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 to 45) Hz	0.027 % of reading + 0.5 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	0.07 % of reading + 1.2 mV	

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AC Voltage – Source [1]	(33 to 330) V		Comparison to Fluke 5520A Multiproduct Calibrator
	45 Hz to 1 kHz	0.015 % of reading + 1.6 mV	
	(1 to 10) kHz	0.016 % of reading + 4.7 mV	
	(10 to 20) kHz	0.02 % 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 1 020) V		
	45 Hz to 1 kHz	0.023 % of reading + 7.8 mV	
	(1 to 5) kHz	0.02 % of reading + 7.8 mV	
	(5 to 10) kHz	0.023 % of reading + 7.8 mV	
AC Voltage – Measure [1]	Up to 10 mV		Comparison to Agilent 3458A Opt 002 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	

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AC Voltage – Measure [1]	(0.1 to 1) V		Comparison to Agilent 3458A Opt 002 8.5 Digit Multimeter
	(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	
	(1 to 10) V		
	(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	

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AC High Voltage – Measure [1]	(0.7 to 10) kV 10 mHz to 200 Hz (200 to 450) Hz (450 to 600) Hz	0.14 % of reading + 0.17 V 0.47 % of reading + 0.17 V 0.87 % of reading + 0.17 V	Comparison to Vitrek 4700 High Voltage Meter
DC Voltage – Source [1]	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 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	Comparison to Fluke 5520A Multiproduct Calibrator
DC Voltage – Measure [1]	Up to 100 mV (0.1 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 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 Opt 002 8.5 Digit Multimeter
DC High Voltage – Measure [1]	(1 to 10) kV	0.039 % of reading + 92 mV	Comparison to Vitrek 4700 High Voltage Meter
Capacitance – Source [1] (Variable Artifact)	1 kHz (50 to 190) pF	0.6 % of reading + 5 pF	Comparison to Decade Capacitance Standard
Capacitance – Source [1] (Simulation)	10 Hz to 10 kHz 220 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 (0.33 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	0.4 % of reading + 7.8 pF 0.4 % of reading + 7.8 pF 0.21 % of reading + 7.8 pF 0.2 % of reading + 78 pF 0.21 % of reading + 78 pF 0.2 % of reading + 0.23 nF 0.21 % of reading + 0.78 nF 0.21 % of reading + 2.3 nF 0.2 % of reading + 7.8 nF 0.32 % of reading + 23 nF 0.37 % of reading + 78 nF	Comparison to Fluke 5520A Multiproduct Calibrator

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Capacitance – Source [1] (Simulation)	DC to 50 Hz (110 to 330) µF DC to 20 Hz (0.33 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 0.6 Hz (11 to 33) mF DC to 0.2 Hz (33 to 110) mF	 0.38 % 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	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 Type E (-270 to -245) °C (-245 to -195) °C (-195 to -155) °C (-155 to -90) °C (-90 to 0) °C (0 to 15) °C (15 to 890) °C (890 to 1 000) °C Type J (-210 to -180) °C (-180 to -120) °C (-120 to -50) °C (-50 to 990) °C (990 to 1 200) °C	 1.2 °C 0.9 °C 0.71 °C 0.55 °C 0.45 °C 0.35 °C 1.6 °C 0.24 °C 0.12 °C 0.095 °C 0.08 °C 0.076 °C 0.064 °C 0.074 °C 0.15 °C 0.12 °C 0.093 °C 0.08 °C 0.094 °C	Comparison to Ectron 1140A Thermocouple Calibrator/Simulator

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Electrical Simulation of Thermocouple Indicating Devices – Measure/Source [1]	Type K		Comparison to Ectron 1140A Thermocouple Calibrator/Simulator
	(-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	
	Type S		
	(-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	

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DC Power – Source [1]			
(0.33 to 330) mA	11 µW to 1.1 mW	0.024 % of reading	
	1.1 mW to 0.11 W	0.027 % of reading	
	(0.11 to 110) W	0.024 % of reading	
	(110 to 330) W	0.018 % of reading	
(0.33 to 3) A	11 µW to 110 mW	0.044 % of reading	Comparison to Fluke 5520A Multiproduct Calibrator
	(0.11 to 990) W	0.053 % of reading	
	(0.99 to 3) kW	0.009 6 % of reading	
(3 to 20.5) A	99 mW to 0.99 W	0.088 % of reading	
	0.99 W to 6.8 kW	0.07 % of reading	
	(6.8 to 20.5) kW	0.04 % of reading	
AC Power – Source [1,2]			
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) Hz		
	(0.3 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		Comparison to Fluke 5520A Multiproduct Calibrator
	(3 to 100) mW	0.089 % of reading	
	100 mW to 300 W	0.078 % of reading	
(0.33 to 0.9) A	(10 to 65) Hz		
	(11 to 300) mW	0.071 % of reading	
	300 mW to 900 W	0.081 % of reading	
(0.9 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 20 kW	0.17 % of reading	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase – Source [1]	(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 30) kHz	 0.11° 0.21° 0.39° 1.9° 3.9° 7.8°	Comparison to Fluke 5520A Multiproduct Calibrator
Oscilloscopes [1,3]			Comparison to Fluke 5520A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
Amplitude – DC			
into 50 Ω load	(-6.6 to 6.6) V	0.2 % of reading + 31 µV	
into 1 MΩ load	(-130 to 130) V	0.039 % 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	 0.19 % 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	 0.078 % of reading + 31 µV 0.19 % of reading + 31 µV	
Time Markers			
into 50 Ω load	1 ns to 20 ms 50 ms 0.1 s 0.2 s 0.5 s 1 s 2 s 5 s	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	
Rise Time – Source			
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	

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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes [1,3]			
Leveled Sine Wave			
into 50 Ω load	5 mVp-p to 5.5 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	
Bandwidth Flatness – Source (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	
Wave Generator – Amplitude (Sine, Square, Triangle)			Comparison to Fluke 5520A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
into 50 Ω load	10 Hz to 10 kHz 1.8 mVp-p to 2.5 Vp-p	2.3 % of reading + 78 µV	
into 1 MΩ load	10 Hz to 10 kHz 1.8 mVp-p to 55 Vp-p	2.3 % of reading + 78 µV	
Wave Generator – Frequency (Sine, Square, Triangle)	10 Hz to 10 kHz	0.001 9 % of reading + 12 mHz	
Wave Generator – Rise Time	250 ps	63 ps	
Input Impedance Measure			
into 50 Ω	(40 to 60) Ω	0.082 % of reading	
into 1 MΩ	(0.5 to 1.5) MΩ	0.081 % of reading	
Input Capacitance Measure	(5 to 50) pF	3.9 % of reading + 0.39 pF	

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Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Micrometers and Calipers [1,4] (Outside, Inside, Depth)	Up to 1 in (1 to 5) in (5 to 18) in	(13 + 4*L*) µin (10 + 4*L*) µin (13 + 4*L*) µin	Comparison to Gage Blocks
Anvil Flatness [1]	Up to 1 in	6.1 µin	Comparison to Optical Flats
Anvil Parallelism	Up to 1 in	8.3 µin	Comparison to Optical Parallels

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI Units)	1 mg 2 mg 3 mg 5 mg 10 mg 20 mg 30 mg 50 mg 100 mg 200 mg 300 mg 500 mg 1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g	1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 1.7 µg 4.3 µg 4.3 µg 4.4 µg 5.2 µg 8.6 µg 12 µg 13 µg 17 µg	Double Substitution Method; ASTM E617 Class 1 Weights, Electronic Balances

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI Units)	100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 5 kg 10 kg	35 µg 0.1 mg 0.13 mg 0.17 mg 0.33 mg 0.98 mg 1.2 mg 1.7 mg 3.4 mg	Double Substitution Method; ASTM E617 Class 1 Weights, Electronic Balances
Mass Determination (SI Units)	1 mg 2 mg 3 mg 5 mg 10 mg 20 mg 30 mg 50 mg 100 mg 200 mg 300 mg 500 mg 1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g 100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 5 kg	3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 3.6 µg 11 µg 11 µg 11 µg 11 µg 18 µg 26 µg 26 µg 41 µg 84 µg 0.2 mg 0.27 mg 0.41 mg 0.83 mg 1.9 mg 2.7 mg 4.1 mg	Double Substitution Method; ASTM E617 Class 2 Weights, Electronic Balances

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI Units)	10 kg 20 kg 25 kg	8.3 mg 0.23 g 0.23 g	Double Substitution Method; ASTM E617 Class 2 Weights, Electronic Balances
Scales and Balances [1,6] (SI Units)	Up to 500 mg (0.5 to 5) g (5 to 10) g (10 to 30) g (30 to 50) g (50 to 100) g (0.1 to 1) kg (1 to 2) kg (2 to 3) kg (3 to 5) kg (5 to 10) kg	1.7 µg 5.2 µg 8.4 µg 22 µg 24 µg 39 µg 2 mg 2.2 mg 2.3 mg 2.6 mg 3.9 mg	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
Scales and Balances [1,6] (Avoirdupois)	Up to 0.5 oz (0.5 to 1) oz (1 to 2) oz (2 to 4) oz (4 to 8) oz 8 oz to 1 lb	0.000 049 oz 0.000 102 oz 0.000 201 oz 0.000 423 oz 0.000 811 oz 0.001 623 oz	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
Scales and Balances [1,6] (Avoirdupois)	(1 to 2) lb (2 to 3) lb (3 to 5) lb (5 to 10) lb (10 to 20) lb (20 to 22) lb	0.000 201 lb 0.000 309 lb 0.000 507 lb 0.001 014 lb 0.002 006 lb 0.003 086 lb	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
Scales and Balances [1,6] (Avoirdupois)	(50 to 1 200) lb	0.012 % of reading	NIST Class F weights and internal calibration procedure utilized for the calibration of the weighing system.
Torque Wrenches [1]	(1 to 10) N·m (6 to 60) N·m (10 to 100) N·m (40 to 400) N·m (100 to 1 000) N·m	1.2 % of reading 1 % of reading 1 % of reading 1 % of reading 1 % of reading	Comparison to Stahlwille Torque Calibrator

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Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic Absolute Pressure Devices [1]	Up to 25 psia (25 to 500) psia	0.001 9 psi 0.006 5 % of reading + 0.001 psi	Comparison to Ruska 7250xi Pressure Controller/Calibrator
Pneumatic Gauge Pressure Devices [1]	(-15 to 15) psi (25 to 500) psi	0.001 6 psi 0.006 5 % of reading	Comparison to Ruska 7250xi Pressure Controller/Calibrator
Pneumatic Compound Devices [1]	(-60 to -6) inH_2O (-6 to 6) inH_2O (-6 to 60) inH_2O (-14.7 to -7.5) psi (-7.5 to 7.5) psi (7.5 to 30) psi	0.007 % of reading + 0.000 005 inH_2O 0.002 1 % of reading + 0.000 3 inH_2O 0.007 % of reading + 0.000 005 inH_2O 0.006 5 % of reading 0.001 5 % of reading + 0.000 38 psi 0.006 5 % of reading	Comparison to Ruska 7250xi Pressure Controller/Calibrator
Hydraulic Gauge Pressure Devices [1]	(200 to 1 600) psig (1 600 to 16 200) psig	0.091 psi 0.005 9 % of reading	Comparison to Fluke P3125-PSI Deadweight Tester

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Relative Humidity – Source	(0 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 75) %RH (75 to 95) %RH	 0.5 %RH 0.65 %RH 0.5 %RH 0.5 %RH 0.7 %RH 0.85 %RH	Comparison to Two-Pressure Humidity Generator
Temperature – Source [1]	(-30 to 125) °C	0.036 °C	Comparison to Liquid Bath, SPRT w/Indicator
Temperature – Measure [1]	(-190 to 0) °C (0 to 420) °C (420 to 660) °C	0.012 °C 0.024 °C 0.035 °C	Direct Measure using SPRT w/Indicator

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Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Reference	10 MHz	5.9 mHz	Comparison to Stanford Research FS725 Rubidium Frequency Oscillator
Period – Source [1]	(1 to 100) s	91 µs/s	Comparison to HP 33120A Function/Arbitrary Waveform Generator
Period – Measure [1]	(1 to 100) s	0.39 ms	Comparison to HP 53230A Universal Counter, Stanford Research FS725 Rubidium Frequency Oscillator
Frequency – Source [1]	1 Hz to 15 MHz	24 µHz/Hz	Comparison to HP 33120A Function/Arbitrary Waveform Generator
Frequency – Source [1] (Sine Wave)	10 mHz to 2 MHz	2 µHz/Hz + 4 µHz	Comparison to Fluke 5520A Multiproduct Calibrator
AC Duty Cycle – Source [1] Square Wave: < 3.3 Vp-p Freq: 100 mHz 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	0.62 % of reading + 78 ns 0.039 % of reading + 78 ns 0.001 6 % of reading + 78 ns 0.039 % of reading + 78 ns 0.62 % of reading + 78 ns	Comparison to Fluke 5520A Multiproduct Calibrator
Frequency – Measure [1]	(1 to 10) Hz 10 Hz to 10 MHz (10 to 350) MHz	0.33 µHz/Hz 93 nHz/Hz 0.33 µHz/Hz	Comparison to HP 53230A Universal Counter, Stanford Research FS725 Rubidium Frequency Oscillator

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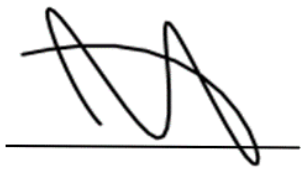
Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Stopwatches, Timers	Up to 599 s/mon	59 ms/d	Comparison to Vibrograf 4500 Timometer

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 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.
5. The reported measurand on the calibration certificate will be in the difference of the nominal and actual mass value in appropriate SI unit.
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. Unless otherwise specified in the far-right column, the laboratory is utilizing an in-house developed calibration procedure.
8. The legal entity for this location is Transcat, Inc.



Jason Stine, Vice President

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