



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

### Transcat – San Juan

281 Calle Matadero  
Urb Puerto Nuevo  
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.

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-2489.05



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)**

**Transcat – San Juan**

281 Calle Matadero

Urb Puerto Nuevo

San Juan, PR 00920

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**CALIBRATION**

Valid to: **September 7, 2025**

Certificate Number: **AC-2489.05**

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source <sup>1</sup>	(29 to 330) $\mu$ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 3.3) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (3.3 to 33) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % of reading + 80 nA 0.12 % of reading + 80 nA 0.097 % of reading + 0.12 $\mu$ A 0.23 % of reading + 0.16 $\mu$ A 0.62 % of reading + 0.16 $\mu$ A 1.2 % of reading + 0.31 $\mu$ A 0.16 % of reading + 0.12 $\mu$ A 0.097 % of reading + 0.12 $\mu$ A 0.078 % of reading + 0.12 $\mu$ A 0.16 % of reading + 0.16 $\mu$ A 0.39 % of reading + 0.23 $\mu$ A 0.78 % of reading + 0.47 $\mu$ A 0.14 % of reading + 1.6 $\mu$ A 0.071 % of reading + 1.6 $\mu$ A 0.035 % of reading + 1.6 $\mu$ A 0.064 % of reading + 1.6 $\mu$ A 0.16 % of reading + 2.3 $\mu$ A 0.31 % of reading + 3.1 $\mu$ A	Fluke 5520A Multiproduct Calibrator

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source <sup>1</sup>	(33 to 330) mA (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (0.33 to 1.1) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (1.1 to 3) A (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (3 to 11) A (10 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20) A (10 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.14 % of reading + 16 μA 0.071 % of reading + 16 μA 0.033 % of reading + 16 μA 0.078 % of reading + 39 μA 0.16 % of reading + 78 μA 0.31 % of reading + 0.16 mA 0.14 % of reading + 78 μA 0.04 % of reading + 78 μA 0.47 % of reading + 0.78 mA 1.9 % of reading + 4 mA 0.14 % of reading + 78 μA 0.049 % of reading + 78 μA 0.47 % of reading + 0.78 mA 1.9 % of reading + 3.9 mA 0.049 % of reading + 1.6 mA 0.079 % of reading + 1.6 mA 2.3 % of reading + 1.6 mA 0.095 % of reading + 3.9 mA 0.11 % of reading + 3.9 mA 2.3 % of reading + 3.9 mA	Fluke 5520A Multiproduct Calibrator
AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor <sup>1</sup>	(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	0.24 % of reading + 19 mA 0.62 % of reading + 21 mA 0.24 % of reading + 70 mA 0.61 % of reading + 78 mA	Fluke 5520A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
AC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor <sup>1</sup>	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	Fluke 5520A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure <sup>1</sup>	Up to 100 $\mu$ A		Agilent 3458A Opt 002 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 5 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	0.071 % 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	0.48 % 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		
DC Current – Source <sup>1</sup>	Up to 330 $\mu$ A	0.012 % of reading + 16 nA	Fluke 5520A Multiproduct Calibrator
	(0.33 to 3.3) mA	0.008 2 % of reading + 39 nA	
	(3.3 to 33) mA	0.009 8 % of reading + 0.19 $\mu$ A	
	(33 to 330) mA	0.007 8 % of reading + 1.9 $\mu$ A	
	(0.33 to 1.1) A	0.016 % of reading + 31 $\mu$ A	
	(1.1 to 3) A	0.03 % of reading + 31 $\mu$ A	
DC Clamp-on Ammeter (Non-Toroidal Type) Hall Effect Sensor <sup>1</sup>	(20 to 55) A	0.47 % of reading + 0.11 A	Fluke 5520A Multiproduct Calibrator, Fluke 5500A/Coil 50-turn Coil
	(55 to 150) A	0.41 % of reading + 0.11 A	
	(150 to 550) A	0.45 % of reading + 0.39 A	
	(550 to 1025) A	0.51 % of reading + 0.39 A	
DC Current – Measure <sup>1</sup>	Up to 100 $\mu$ A	33 $\mu$ A/A + 0.92 nA	Agilent 3458A Opt 002 8.5 Digit Multimeter
	(0.1 to 1) mA	29 $\mu$ A/A + 5.8 nA	
	(1 to 10) mA	29 $\mu$ A/A + 58 nA	
	(10 to 100) mA	46 $\mu$ A/A + 0.58 $\mu$ A	
	(0.1 to 1) A	0.13 % of reading + 12 $\mu$ A	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance – Source <sup>1</sup> (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	Fluke 5520A Multiproduct Calibrator
DC Resistance – Source <sup>1</sup> (Artifact)	10 GΩ 100 GΩ	63 MΩ 1.3 GΩ	Decade Resistance Standard
DC Resistance – Measure <sup>1</sup>	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	Agilent 3458A Opt 002 8.5 Digit Multimeter
AC Voltage – Source <sup>1</sup>	(1 to 33) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz (33 to 330) mV (10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.065 % of reading + 4.7 μV 0.014 % of reading + 4.7 μV 0.017 % of reading + 4.7 μV 0.079 % of reading + 4.7 μV 0.27 % of reading + 9.3 μV 0.62 % of reading + 39 μV 0.027 % of reading + 6.2 μV 0.012 % of reading + 6.2 μV 0.013 % of reading + 6.2 μV 0.027 % of reading + 6.2 μV 0.062 % of reading + 25 μV 0.16 % of reading + 54 μV	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 Voltage – Source <sup>1</sup>	(0.33 to 3.3) V (10 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 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 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (330 to 1 020) V 45 Hz to 1 kHz (1 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 + 0.5 mV 0.012 % of reading + 0.47 mV 0.019 % of reading + 0.47 mV 0.027 % of reading + 0.47 mV 0.07 % of reading + 1.2 mV 0.015 % of reading + 1.6 mV 0.016 % of reading + 4.7 mV 0.02 % 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	Fluke 5520A 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 to 4) 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	Agilent 3458A Opt 002 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>	(10 to 100) mV		Agilent 3458A Opt 002 8.5 Digit Multimeter
	(1 to 40) Hz	0.013 % of reading + 4.6 $\mu$ V	
	40 Hz to 1 kHz	0.009 7 % of reading + 2.3 $\mu$ V	
	(1 to 20) kHz	0.017 % of reading + 2.3 $\mu$ V	
	(20 to 50) kHz	0.038 % of reading + 2.3 $\mu$ V	
	(50 to 100) kHz	0.093 % of reading + 2.3 $\mu$ V	
	(100 to 300) kHz	0.36 % of reading + 12 $\mu$ V	
	300 kHz to 1 MHz	1.2 % of reading + 12 $\mu$ V	
	(1 to 2) MHz	1.8 % of reading + 12 $\mu$ V	
	(2 to 4) MHz	4.7 % of reading + 81 $\mu$ V	
	(4 to 8) MHz	4.7 % of reading + 92 $\mu$ V	
	(8 to 10) MHz	17 % of reading + 0.12 mV	
	(0.1 to 1) V		
	(1 to 40) Hz	0.008 8 % of reading + 46 $\mu$ V	
	40 Hz to 1 kHz	0.008 3 % of reading + 23 $\mu$ V	
	(1 to 20) kHz	0.017 % of reading + 23 $\mu$ V	
	(20 to 50) kHz	0.036 % of reading + 23 $\mu$ V	
	(50 to 100) kHz	0.093 % of reading + 23 $\mu$ V	
	(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		



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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>	(10 to 100) 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 (100 to 700) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % of reading + 4.6 mV 0.024 % of reading + 2.3 mV 0.024 % of reading + 2.3 mV 0.041 % of reading + 2.3 mV 0.14 % of reading + 2.3 mV 0.46 % of reading + 12 mV 1.7 % of reading + 12 mV 0.048 % of reading + 46 mV 0.048 % of reading + 23 mV 0.071 % of reading + 23 mV 0.19 % of reading + 23 mV 0.35 % of reading + 23 mV	Agilent 3458A Opt 002 8.5 Digit Multimeter
AC High Voltage – Measure <sup>1</sup>	(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	Vitrek 4700 High Voltage Meter
DC Voltage – Source <sup>1</sup>	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	Fluke 5520A Multiproduct Calibrator
DC Voltage – Measure <sup>1</sup>	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	Agilent 3458A Opt 002 8.5 Digit Multimeter
DC High Voltage – Measure <sup>1</sup>	(1 to 10) kV	0.039 % of reading + 92 mV	Vitrek 4700 High Voltage Meter
Capacitance – Source <sup>1</sup> (Variable Artifact)	1 kHz (50 to 190) pF	0.6 % of reading + 5 pF	Decade Capacitance Standard





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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 10 kHz 220 pF to 1.1 nF	0.4 % of reading + 7.8 pF	Fluke 5520A Multiproduct Calibrator
	10 Hz to 3 kHz (1.1 to 3.3) nF	0.4 % of reading + 7.8 pF	
	10 Hz to 1 kHz (3.3 to 11) nF	0.21 % of reading + 7.8 pF	
	(11 to 33) nF	0.2 % of reading + 78 pF	
	(33 to 110) nF	0.21 % of reading + 78 pF	
	(110 to 330) nF	0.2 % of reading + 0.23 nF	
	(10 to 600) Hz (0.33 to 1.1) μF	0.21 % of reading + 0.78 nF	
	(10 to 300) Hz (1.1 to 3.3) μF	0.21 % of reading + 2.3 nF	
	(10 to 150) Hz (3.3 to 11) μF	0.2 % of reading + 7.8 nF	
	(10 to 120) Hz (11 to 33) μF	0.32 % of reading + 23 nF	
	(10 to 80) Hz (33 to 110) μF	0.37 % of reading + 78 nF	
	DC to 50 Hz (110 to 330) μF	0.38 % of reading + 0.23 μF	
	DC to 20 Hz (0.33 to 1.1) mF	0.35 % of reading + 0.78 μF	
	DC to 6 Hz (1.1 to 3.3) mF	0.35 % of reading + 2.3 μF	
	DC to 2 Hz (3.3 to 11) mF	0.35 % of reading + 7.8 μF	
	DC to 0.6 Hz (11 to 33) mF	0.58 % of reading + 23 μF	
	DC to 0.2 Hz (33 to 110) mF	0.85 % of reading + 78 μF	
Electrical Simulation of Thermocouple Indicating Devices – Measure/Source <sup>1</sup>	Type B (250 to 350) °C	1.2 °C	Ectron 1140A Thermocouple Calibrator/Simulator
	(350 to 445) °C	0.9 °C	
	(445 to 580) °C	0.71 °C	
	(580 to 750) °C	0.55 °C	
	(750 to 1 000) °C	0.45 °C	
	(1 000 to 1 820) °C	0.35 °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 <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		

**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			
DC Power – Source <sup>1</sup>	(0.33 to 330) mA		Fluke 5520A Multiproduct Calibrator	
		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
		(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 <sup>1,2</sup> PF = 1	(3.3 to 9) mA	(10 to 65) Hz		Fluke 5520A Multiproduct Calibrator
		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	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Power – Source <sup>1,2</sup> PF = 1 (33 to 90) mA	(10 to 65) Hz (1 to 30) mW 30 mW to 90 W	0.071 % of reading 0.057 % of reading	Fluke 5520A Multiproduct Calibrator
(90 to 330) mA	(10 to 65) Hz (3 to 100) mW 100 mW to 300 W	0.089 % of reading 0.078 % of reading	
(0.33 to 0.9) A	(10 to 65) Hz (11 to 300) mW 300 mW to 900 W	0.071 % of reading 0.081 % of reading	
(0.9 to 2.2) A	(10 to 65) Hz (30 to 720) mW 0.72 W to 2 kW	0.089 % of reading 0.079 % of reading	
(2.2 to 4.5) A	(10 to 65) Hz 80 mW to 1.4 W 1.4 W to 4.5 kW	0.088 % of reading 0.18 % of reading	
(4.5 to 20.5) A	(10 to 65) Hz 150 mW to 20 kW	0.17 % of reading	
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 30) kHz	0.11 ° 0.21 ° 0.39 ° 1.9 ° 3.9 ° 7.8 °	Fluke 5520A Multiproduct Calibrator
Oscilloscopes <sup>1,3</sup> Amplitude – DC into 50 Ω load into 1 MΩ load	(-6.6 to 6.6) V (-130 to 130) V	0.2 % of reading + 31 μV 0.039 % of reading + 31 μV	Fluke 5520A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
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	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes <sup>1,3</sup> 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	Fluke 5520A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
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 250 ps (nominal) 250 ps (nominal)	50 ps 50 ps	
Leveled Sine Wave into 50 Ω load	5 mVp-p to 5.5 Vp-p 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.8 % of reading + 0.23 mV 2.8 % of reading + 0.23 mV 3.2 % of reading + 0.23 mV 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 (100 to 300) MHz (300 to 600) MHz	1.4 % of reading + 78 μV 1.8 % of reading + 78 μV 3.2 % of reading + 78 μV	
Wave Generator – Amplitude (Sine, Square, Triangle) 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	

**Electrical – DC/Low Frequency**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes <sup>1,3</sup>			
Wave Generator – Frequency (Sine, Square, Triangle)	10 Hz to 10 kHz	0.001 9 % of reading + 12 mHz	Fluke 5520A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
Wave Generator – Rise Time	250 ps	63 ps	
Input Impedance Measure into 50 Ω	(40 to 60) Ω	0.082 % of reading	
Input Impedance Measure 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	

**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)	Up to 1 in (1 to 5) in (5 to 18) in	(13 + 4L) μin (10 + 4L) μin (13 + 4L) μin	Gage Blocks
Anvil Flatness <sup>1</sup>	Up to 1 in	6.1 μin	Optical Flats

**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	1.7 μg 1.7 μg 1.7 μg 1.7 μg 1.7 μg	Echelon II

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI Units)	20 mg	1.7 µg	Echelon II
	30 mg	1.7 µg	
	50 mg	1.7 µg	
	100 mg	1.7 µg	
	200 mg	1.7 µg	
	300 mg	1.7 µg	
	500 mg	1.7 µg	
	1 g	4.3 µg	
	2 g	4.3 µg	
	3 g	4.4 µg	
	5 g	5.2 µg	
	10 g	8.6 µg	
	20 g	12 µg	
	30 g	13 µg	
	50 g	17 µg	
	100 g	35 µg	
	200 g	0.1 mg	
	300 g	0.13 mg	
	500 g	0.17 mg	
	1 kg	0.33 mg	
2 kg	0.98 mg		
3 kg	1.2 mg		
5 kg	1.7 mg		
10 kg	3.4 mg		
Mass Determination (SI Units)	1 mg	3.6 µg	Echelon III
	2 mg	3.6 µg	
	3 mg	3.6 µg	
	5 mg	3.6 µg	
	10 mg	3.6 µg	
	20 mg	3.6 µg	
	30 mg	3.6 µg	
	50 mg	3.6 µg	
	100 mg	3.6 µg	
	200 mg	3.6 µg	
	300 mg	3.6 µg	
	500 mg	3.6 µg	
	1 g	11 µg	
	2 g	11 µg	
	3 g	11 µg	
	5 g	11 µg	
	10 g	18 µg	

**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI Units)	20 g 30 g 50 g 100 g 200 g 300 g 500 g 1 kg 2 kg 3 kg 5 kg 10 kg 20 kg 25 kg	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 8.3 mg 0.23 g 0.23 g	Echelon III
Mass Determination <sup>5</sup> (Avoirdupois)	1 lb 2 lb 3 lb 5 lb 10 lb 20 lb 30 lb 50 lb	34 mg 34 mg 34 mg 34 mg 34 mg 34 mg 35 mg 41 mg	ASTM E617 Class 0 Weights, Electronic Balances
Scales and Balances <sup>1,6</sup> (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 <sup>1,6</sup> (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.





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**Mass and Mass Related**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances <sup>1,6</sup> (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 <sup>1,6</sup> (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 <sup>1</sup>	(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	Stahlwille Torque Calibrator
Pneumatic Absolute Pressure Devices <sup>1</sup>	Up to 25 psia (25 to 500) psia	0.001 9 psi 0.006 5 % of reading + 0.001 psi	Ruska 7250xi Pressure Controller/Calibrator
Pneumatic Pressure Gages <sup>1</sup>	(-15 to 15) psi (25 to 500) psi	0.001 6 psi 0.006 5 % of reading	Ruska 7250xi Pressure Controller/Calibrator
Hydraulic Pressure Gages <sup>1</sup>	(100 to 15 000) psig	0.009 % of reading	Ametek T-150 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	Two-Pressure Humidity Generator
Temperature – Source <sup>1</sup>	(-30 to 125) °C	0.036 °C	Liquid Bath, SPRT w/Indicator

**Thermodynamic**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Measure <sup>1</sup>	(-190 to 0) °C (0 to 420) °C (420 to 660) °C	0.012 °C 0.024 °C 0.035 °C	SPRT w/Indicator

**Time and Frequency**

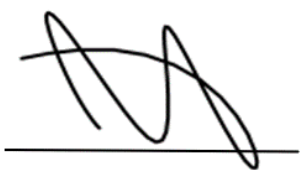
Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency Reference	10 MHz	5.9 mHz	Stanford Research FS725 Rubidium Frequency Oscillator
Period – Source <sup>1</sup>	(1 to 100) s	91 μs/s	HP 33120A Function/Arbitrary Waveform Generator
Period – Measure <sup>1</sup>	(1 to 100) s	0.39 ms	HP 53230A Universal Counter, Stanford Research FS725 Rubidium Frequency Oscillator
Frequency – Source <sup>1</sup>	1 Hz to 15 MHz	24 μHz/Hz	HP 33120A Function/Arbitrary Waveform Generator
Frequency – Source <sup>1</sup> (Sine Wave)	10 mHz to 2 MHz	2 μHz/Hz + 4 μHz	Fluke 5520A Multiproduct Calibrator
AC Duty Cycle – Source <sup>1</sup> 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	Fluke 5520A Multiproduct Calibrator
Frequency – Measure <sup>1</sup>	(1 to 10) Hz 10 Hz to 10 MHz (10 to 350) MHz	0.33 μHz/Hz 93 nHz/Hz 0.33 μHz/Hz	HP 53230A Universal Counter, Stanford Research FS725 Rubidium Frequency Oscillator

**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	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. The legal entity for this location is Transcat, Inc.
  8. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.05.



Jason Stine, Vice President

