



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat – San Diego
10130 Sorrento Valley Rd, Suites C-D
San Diego, CA 92121

Fulfills the requirements of

ISO/IEC 17025:2017

and national standards

ANSI/NCSL Z540-1-1994 (R2002),
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: 01 September 2028
Certificate Number: L2214



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 Diego

10130 Sorrento Valley Rd, Suites C-D

San Diego, CA 92121

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CALIBRATION

ISO/IEC 17025 Accreditation Granted: **25 August 2026**

Certificate Number: **L2214**

Certificate Expiry Date: **01 September 2028**

Chemical Quantities

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
pH Meters ¹	4 pH 7 pH 10 pH	0.62 pH 0.62 pH 2.1 pH	Comparison to Certified Reference pH Solutions
Conductivity Meters ¹	1 µS 10 µS 84 µS 100 µS 1,000 µS 10,000 µS 12,880 µS 100,000 µS	0.63 µS 0.63 µS 0.98 µS 2.1 µS 4.8 µS 43 µS 44 µS 370 µS	Comparison to Certified Reference Conductivity Solutions

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Sine Wave Flatness	Up to 3V 10 Hz to 1 MHz (1 to 10) MHz (10 to 30) MHz (30 to 50) MHz (50 to 80) MHz (80 to 100) MHz	0.082 % of reading 0.091 % of reading 0.11 % of reading 0.19 % of reading 0.32 % of reading 0.38 % of reading	Indirect Comparison to Thermal Voltage Converter and Digital Multimeter
AC Current – Generate	Up to 220 μ A (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 to 2.2) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (2.2 to 22) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (22 to 220) mA (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (0.22 to 2.2) A 20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.032 % of reading + 16 nA 0.019 % of reading + 10 nA 0.014 % of reading + 8 nA 0.026 % of reading + 10 nA 0.11 % of reading + 65 nA 0.031 % of reading + 40 nA 0.019 % of reading + 35 nA 0.014 % of reading + 35 nA 0.026 % of reading + 0.11 μ A 0.11 % of reading + 0.65 μ A 0.033 % of reading + 0.4 μ A 0.02 % of reading + 0.35 μ A 0.015 % of reading + 0.35 μ A 0.022 % of reading + 0.55 μ A 0.11 % of reading + 5 μ A 0.033 % of reading + 4 μ A 0.018 % of reading + 3.5 μ A 0.014 % of reading + 2.5 μ A 0.021 % of reading + 3.5 μ A 0.11 % of reading + 10 μ A 0.047 % of reading + 0.17 mA 0.095 % of reading + 0.38 mA 0.36 % of reading + 0.16 mA	Comparison to Fluke 5720A Multiproduct Calibrator
AC Current – Generate	(2.2 to 11) A 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.048 % of reading + 0.17 mA 0.096 % of reading + 0.38 mA 0.36 % of reading + 0.75 mA	Comparison to Fluke 5720A Multiproduct Calibrator, Fluke 5725 Amplifier

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Generate	(11 A to 20.5) A (10 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.095 % of reading + 3.9 mA 0.12 % of reading + 3.9 mA 2.3 % of reading + 3.9 mA	Comparison to Fluke 5522A Multiproduct Calibrator
AC Current – Measure	Up to 200 μ A 1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (0.2 to 2) mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (2 to 20) mA (1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (20 to 200) mA 1 Hz to 10 Hz 10 Hz to 10 kHz (10 to 30) kHz (0.2 to 2) A 10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (2 to 20) A 10 Hz to 2 kHz (2 to 10) kHz	0.031 % of reading + 20 nA 0.071 % of reading + 20 nA 0.4 % of reading + 20 nA 0.031 % of reading + 0.2 μ A 0.03 % of reading + 0.2 μ A 0.071 % of reading + 0.2 μ A 0.4 % of reading + 0.2 μ A 0.031 % of reading + 2 μ A 0.03 % of reading + 2 μ A 0.071 % of reading + 2 μ A 0.4 % of reading + 2 μ A 0.031 % of reading + 20 μ A 0.029 % of reading + 20 μ A 0.063 % of reading + 20 μ A 0.062 % of reading + 0.2 mA 0.074 % of reading + 0.2 mA 0.3 % of reading + 0.2 mA 0.082 % of reading + 2 mA 0.25 % of reading + 2 mA	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter
AC Current – Source/Measure	(20 to 100) A 50 to 60 Hz 400 Hz	0.028 % of reading + 10 mA 0.12 % of reading + 10 mA	Comparison to AC Current Shunt, 8.5 Digit Multimeter, Current Source
AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor	(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	Comparison to Multiproduct Calibrator, Multi-turn Current Coil

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor	(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 Multiproduct Calibrator, Multi-turn Current Coil
AC Power – Generate (10 to 65) Hz (PF = 1)	(3.3 to 9) mA (0.11 to 3) mW 3 mW to 9 W (9 to 33) mA (0.3 to 10) mW 10 mW to 33 W (33 to 90) mA (1 to 30) mW 30 mW to 90 W (90 to 330) mA (3 to 100) mW 100 mW to 300 W (0.33 to 0.9) A (11 to 300) mW 300 mW to 900 W (0.9 to 2.2) A 30 mW to 0.72 W 0.72 W to 2 kW (2.2 to 4.5) A 80 mW to 1.4 W 1.4 W to 4.5 kW (4.5 to 20.5) A 150 mW to 6.7 W 6.7 W to 20 kW	0.13 % of reading 0.077 % of reading 0.089 % of reading 0.077 % of reading 0.071 % of reading 0.057 % of reading 0.089 % of reading 0.078 % of reading 0.071 % of reading 0.081 % of reading 0.089 % of reading 0.079 % of reading 0.088 % of reading 0.18 % of reading 0.17 % of reading 0.17 % of reading	Comparison to Fluke 5522A Multiproduct Calibrator
AC Voltage – Generate	Up to 2.2 mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.16 % of reading + 4 μ V 0.1 % of reading + 4 μ V 0.077 % of reading + 4 μ V 0.12 % of reading + 4 μ V 0.17 % of reading + 5 μ V 0.33 % of reading + 10 μ V 0.47 % of reading + 20 μ V 0.58 % of reading + 20 μ V	Comparison to Fluke 5720A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate	(2.2 to 22) mV		Comparison to Fluke 5720A Multiproduct Calibrator
	(10 to 20) Hz	0.044 % of reading + 4 μ V	
	(20 to 40) Hz	0.031 % of reading + 4 μ V	
	40 Hz to 20 kHz	0.015 % of reading + 4 μ V	
	(20 to 50) kHz	0.031 % of reading + 4 μ V	
	(50 to 100) kHz	0.059 % of reading + 5 μ V	
	(100 to 300) kHz	0.12 % of reading + 10 μ V	
	(300 to 500) kHz	0.16 % of reading + 20 μ V	
	500 kHz to 1 MHz	0.3 % of reading + 20 μ V	
	(22 to 220) mV		
	(10 to 20) Hz	0.028 % of reading + 12 μ V	
	(20 to 40) Hz	0.011 % of reading + 7 μ V	
	40 Hz to 20 kHz	0.009 % of reading + 7 μ V	
	(20 to 50) kHz	0.021 % of reading + 7 μ V	
	(50 to 100) kHz	0.047 % of reading + 17 μ V	
	(100 to 300) kHz	0.092 % of reading + 20 μ V	
	(300 to 500) kHz	0.14 % of reading + 25 μ V	
	500 kHz to 1 MHz	0.28 % of reading + 45 μ V	
	(0.22 to 2.2) V		
	(10 to 20) Hz	0.028 % of reading + 40 μ V	
	(20 to 40) Hz	0.01 % of reading + 15 μ V	
	40 Hz to 20 kHz	0.005 % of reading + 8 μ V	
	(20 to 50) kHz	0.008 % of reading + 10 μ V	
	(50 to 100) kHz	0.012 % of reading + 30 μ V	
	(100 to 300) kHz	0.043 % of reading + 80 μ V	
	(300 to 500) kHz	0.1 % of reading + 0.2 mV	
	500 kHz to 1 MHz	0.18 % of reading + 0.3 mV	
	(2.2 to 22) V		
	(10 to 20) Hz	0.028 % of reading + 0.4 mV	
	(20 to 40) Hz	0.01 % of reading + 0.15 mV	
	40 Hz to 20 kHz	0.005 % of reading + 50 μ V	
	(20 to 50) kHz	0.008 % of reading + 0.1 mV	
	(50 to 100) kHz	0.011 % of reading + 0.2 mV	
	(100 to 300) kHz	0.03 % of reading + 0.6 mV	
	(300 to 500) kHz	0.1 % of reading + 2 mV	
	500 kHz to 1 MHz	0.17 % of reading + 3.2 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Generate	(22 to 220) V (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.028 % of reading + 4 mV 0.01 % of reading + 1.5 mV 0.006 % of reading + 0.6 mV 0.009 % of reading + 1 mV 0.016 % of reading + 2.5 mV 0.09 % of reading + 16 mV	Comparison to Fluke 5720A Multiproduct Calibrator
AC Voltage – Generate	(220 to 750) V (30 to 50) kHz (50 to 100) kHz (220 to 1 100) V 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.061 % of reading + 11 mV 0.23 % of reading + 45 mV 0.011 % of reading + 4 mV 0.017 % of reading + 6 mV 0.061 % of reading + 11 mV	Comparison to Fluke 5720A Multiproduct Calibrator, Fluke 5725 Amplifier
AC Voltage – Measure	Up to 220 mV (1 to 10) Hz (0.22 to 220) V (1 to 10) Hz (220 to 1 000) V (1 to 10) Hz	0.017 % of reading + 70 μ V 0.015 % of reading + 60 μ V 0.015 % of reading + 70 μ V	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter
AC Voltage – Measure	(0.6 to 2.2) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz (2.2 to 7) mV (10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.17 % of reading + 1.3 μ V 0.074 % of reading + 1.3 μ V 0.042 % of reading + 1.3 μ V 0.081 % of reading + 2 μ V 0.12 % of reading + 2.5 μ V 0.23 % of reading + 4 μ V 0.24 % of reading + 8 μ V 0.35 % of reading + 8 μ V 0.085 % of reading + 1.3 μ V 0.037 % of reading + 1.3 μ V 0.021 % of reading + 1.3 μ V 0.04 % of reading + 2 μ V 0.06 % of reading + 2.5 μ V 0.12 % of reading + 4 μ V 0.13 % of reading + 8 μ V 0.23 % of reading + 8 μ V	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(7 to 22) mV		Comparison to Fluke 8508A 8.5 Digit Reference Multimeter
	(10 to 20) Hz	0.029 % of reading + 1.3 μ V	
	(20 to 40) Hz	0.019 % of reading + 1.3 μ V	
	40 Hz to 20 kHz	0.011 % of reading + 1.3 μ V	
	(20 to 50) kHz	0.021 % of reading + 2 μ V	
	(50 to 100) kHz	0.031 % of reading + 2.5 μ V	
	(100 to 300) kHz	0.081 % of reading + 4 μ V	
	(300 to 500) kHz	0.089 % of reading + 8 μ V	
	500 kHz to 1 MHz	0.17 % of reading + 8 μ V	
	(22 to 70) mV		
	(10 to 20) Hz	0.024 % of reading + 1.5 μ V	
	(20 to 40) Hz	0.012 % of reading + 1.5 μ V	
	40 Hz to 20 kHz	5 μ V/V + 1.5 μ V	
	(20 to 50) kHz	0.013 % of reading + 2 μ V	
	(50 to 100) kHz	0.026 % of reading + 2.5 μ V	
	(100 to 300) kHz	0.051 % of reading + 4 μ V	
	(300 to 500) kHz	0.067 % of reading + 8 μ V	
	500 kHz to 1 MHz	0.11 % of reading + 8 μ V	
	(70 to 220) mV		
	(10 to 20) Hz	0.021 % of reading + 1.5 μ V	
	(20 to 40) Hz	76 μ V/V + 1.5 μ V	
	40 Hz to 20 kHz	33 μ V/V + 1.5 μ V	
	(20 to 50) kHz	51 μ V/V + 2 μ V	
	(50 to 100) kHz	79 μ V/V + 2.5 μ V	
	(100 to 300) kHz	0.018 % of reading + 4 μ V	
	(300 to 500) kHz	0.03 % of reading + 8 μ V	
	500 kHz to 1 MHz	0.096 % of reading + 8 μ V	
	(2.2 to 7) V		
	(10 to 20) Hz	0.02 % of reading	
	(20 to 40) Hz	67 μ V/V	
	40 Hz to 20 kHz	24 μ V/V	
	(20 to 50) kHz	48 μ V/V	
	(50 to 100) kHz	81 μ V/V	
	(100 to 300) kHz	0.02 % of reading	
	(300 to 500) kHz	0.04 % of reading	
	500 kHz to 1 MHz	0.12 % of reading	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure	(7 to 22) V		Comparison to Fluke 8508A 8.5 Digit Reference Multimeter
	(10 to 20) Hz	0.02% of reading	
	(20 to 40) Hz	67 μ V/V	
	40 Hz to 20 kHz	27 μ V/V	
	(20 to 50) kHz	48 μ V/V	
	(50 to 100) kHz	81 μ V/V	
	(100 to 300) kHz	0.02 % of reading	
	(300 to 500) kHz	0.04 % of reading	
	500 kHz to 1 MHz	0.12 % of reading	
	(22 to 70) V		
	(10 to 20) Hz	0.02 % of reading	
	(20 to 40) Hz	68 μ V/V	
	40 Hz to 20 kHz	32 μ V/V	
	(20 to 50) kHz	57 μ V/V	
	(50 to 100) kHz	94 μ V/V	
	(100 to 300) kHz	0.02 % of reading	
	(300 to 500) kHz	0.04 % of reading	
	500 kHz to 1 MHz	0.12 % of reading	
	(70 to 220) V		
	(10 to 20) Hz	0.02 % of reading	
	(20 to 40) Hz	68 μ V/V	
	40 Hz to 20 kHz	31 μ V/V	
	(20 to 50) kHz	69 μ V/V	
	(50 to 100) kHz	98 μ V/V	
	(100 to 300) kHz	0.02 % of reading	
	(300 to 500) kHz	0.05 % of reading	
	(220 to 700) V		
	(10 to 20) Hz	0.02 % of reading	
	(20 to 40) Hz	99 μ V/V	
	40 Hz to 20 kHz	41 μ V/V	
	(20 to 50) kHz	0.01 % of reading	
	(50 to 100) kHz	0.05 % of reading	
	(700 to 1 000) V		
	(10 to 20) Hz	0.02 % of reading	
	(20 to 40) Hz	99 μ V/V	
	40 Hz to 20 kHz	38 μ V/V	
	(20 to 50) kHz	0.01 % of reading	
	(50 to 100) kHz	0.05 % of reading	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC High Voltage – Measure	(0.7 to 5) kV 10 mHz to 10 Hz	0.14 % of reading + 0.17 V	Comparison to \ Vitrek 4700 High Voltage Meter with Associated High Voltage Probes HVL-35, HVL-70, HVL-100
	(5 to 30) kV 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	
Capacitance – Source (Simulation)	(220 to 400) pF 10 Hz to 10 kHz	0.4 % of reading + 7.8 pF	Comparison to Fluke 5522A Multiproduct Calibrator
	(0.4 to 1.1) nF 10 Hz to 10 kHz	0.4 % of reading + 7.8 pF	
	(1.1 to 3.3) nF 10 Hz to 3 kHz	0.4 % of reading + 7.8 pF	
	(3.3 to 11) nF 10 Hz to 1 kHz	0.21 % of reading + 7.8 pF	
	(11 to 33) nF 10 Hz to 1 kHz	0.2 % of reading + 78 pF	
	(33 to 110) nF 10 Hz to 1 kHz	0.21 % of reading + 78 pF	
	(110 to 330) nF 10 Hz to 1 kHz	0.2 % of reading + 0.23 nF	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source (Simulation)	(0.33 to 1.1) μF (10 to 600) Hz (1.1 to 3.3) μF (10 to 300) Hz (3.3 to 11) μF (10 to 150) Hz (11 to 33) μF (10 to 120) Hz (33 to 110) μF (10 to 80) Hz (110 to 330) μF DC to 50 Hz (0.33 to 1.1) mF DC to 20 Hz (1.1 to 3.3) mF DC to 6 Hz (3.3 to 11) mF DC to 2 Hz (11 to 33) mF DC to 0.6 Hz (33 to 110) mF DC to 0.2 Hz	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 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 5522A Multiproduct Calibrator
Capacitance – Source (Fixed Artifacts)	100 nF 1 μF	1.2 nF 1.2 nF	Comparison to Fixed Capacitors
DC Current – Generate	Up to 220 μA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	45 $\mu\text{A/A}$ + 6.9 nA 39 $\mu\text{A/A}$ + 8.1 nA 39 $\mu\text{A/A}$ + 46 nA 58 $\mu\text{A/A}$ + 0.7 μA 0.24 mA/A + 12 μA	Comparison to Fluke 5720A Multiproduct Calibrator
DC Current – Generate	(2.2 to 11) A	0.036 % of reading + 0.48 mA	Comparison to Fluke 5720A Multiproduct Calibrator, Fluke 5725 Amplifier
DC Current – Generate	(11 to 20) A	0.093 % of reading + 0.58 mA	Comparison to Fluke 5522A Multiproduct Calibrator
DC Current – Measure	Up to 2 mA (2 to 20) mA (20 to 100) mA (0.1 to 1) A (1 to 20) A	12 $\mu\text{A/A}$ + 2 μA 14 $\mu\text{A/A}$ + 2 μA 8.5 $\mu\text{A/A}$ 8.5 $\mu\text{A/A}$ + 6 μA 40 $\mu\text{A/A}$ + 8 μA	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source/Measure	(20 to 100) A	0.019 % of reading + 10 mA	Comparison to DC Current Shunt, 8.5 Digit Multimeter, Current Source
DC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor	(20 to 54.999 5) A (55 to 149.999 5) A (150 to 549.995) 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 Multiproduct Calibrator, Multi-Turn Current Coil
DC Power – Generate	(0.33 to 330) mA 11 μ W to 1.1 mW (1.1 to 110) mW (0.11 to 110) W (110 to 330) W (0.33 to 3) A (11 to 110) mW 110 mW to 990 W 1 W to 3 kW (3 to 20.5) A 99 mW to 0.99 W 0.99 W to 6.8 kW 6.8 W to 20.5 kW	0.024 % of reading 0.027 % of reading 0.024 % of reading 0.018 % of reading 0.044 % of reading 0.053 % of reading 0.009 6 % of reading 0.088 % of reading 0.07 % of reading 0.04 % of reading	Comparison to Fluke 5522A Multiproduct Calibrator
DC Resistance – Generate (Fixed Values)	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω	98 $\mu\Omega/\Omega$ 96 $\mu\Omega/\Omega$ 24 $\mu\Omega/\Omega$ 25 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 9.4 m Ω /k Ω 10 m Ω /k Ω 10 m Ω /k Ω 10 m Ω /k Ω 12.6 m Ω /k Ω 29.5 m Ω /k Ω	Comparison to Fluke 5720A Multiproduct Calibrator
DC Resistance – Generate (Fixed Values)	1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	22 Ω /M Ω 125 Ω /M Ω 74 Ω /M Ω 0.65 k Ω /M Ω 0.6 k Ω /M Ω	Comparison to Fluke 5720A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance – Generate (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 111) Ω (110 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω (0.33 to 1.1) M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (0.33 to 1.1) G Ω	32 $\mu\Omega/\Omega$ + 0.78 m Ω 24 $\mu\Omega/\Omega$ + 1.2 m Ω 22 $\mu\Omega/\Omega$ + 1.1 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 27 $\mu\Omega/\Omega$ + 1.6 Ω 26 $\mu\Omega/\Omega$ + 1.6 Ω 66 $\mu\Omega/\Omega$ + 23 Ω 0.1 m Ω/Ω + 39 Ω 0.19 m Ω/Ω + 1.9 k Ω 0.41 m Ω/Ω + 2.3 k Ω 0.23 % of reading + 78 k Ω 12 % of reading + 0.39 M Ω	Comparison to Fluke 5522A Multiproduct Calibrator
DC Low Resistance – Generate (Fixed Artifacts)	1 m Ω 10 m Ω 100 m Ω	0.058 % of reading + 7 n Ω 0.058 % of reading + 0.16 $\mu\Omega$ 0.058 % of reading + 0.65 $\mu\Omega$	Comparison to Shunts
DC Resistance – Generate (Fixed Artifacts)	1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω 1 G Ω 10 G Ω 100 G Ω 1 T Ω 10 T Ω	29 $\mu\Omega$ 0.29 m Ω 2.9 m Ω 37 Ω + 1.2 Ω/V 1.2 k Ω + 12 Ω/V 18 k Ω + 0.12 k Ω/V 1.2 M Ω + 1.2 k Ω/V 14 M Ω + 23 k Ω/V 1.2 G Ω + 0.58 M Ω/V 12 G Ω + 12 M Ω/V 0.12 T Ω + 0.12 T Ω/V	Comparison to Fixed Resistors
DC Resistance – Measure	Up to 2 Ω (2 to 20) Ω 20 Ω to 200 k Ω (0.2 to 2) M Ω (2 to 20) M Ω (20 to 200) M Ω (0.2 to 2) G Ω	17 $\mu\Omega/\Omega$ + 2 $\mu\Omega$ 9.5 $\mu\Omega/\Omega$ + 0.7 $\mu\Omega$ 8 $\mu\Omega/\Omega$ + 0.25 $\mu\Omega$ 9 $\mu\Omega/\Omega$ + 0.5 $\mu\Omega$ 20 $\mu\Omega/\Omega$ + 5 $\mu\Omega$ 0.012 % of reading + 50 $\mu\Omega$ 0.15 % of reading + 2 $\mu\Omega$	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Source	Pt 385, 100 Ω		Comparison to Fluke 5522A Multiproduct Calibrator
	(-200 to -80) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$	
	(-80 to 0) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$	
	(0 to 100) $^{\circ}\text{C}$	0.054 $^{\circ}\text{C}$	
	(100 to 300) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.078 $^{\circ}\text{C}$	
	(400 to 630) $^{\circ}\text{C}$	0.093 $^{\circ}\text{C}$	
	(630 to 800) $^{\circ}\text{C}$	0.18 $^{\circ}\text{C}$	
	Pt 385, 200 Ω		
	(-200 to -80) $^{\circ}\text{C}$	0.031 $^{\circ}\text{C}$	
	(-80 to 0) $^{\circ}\text{C}$	0.031 $^{\circ}\text{C}$	
	(0 to 100) $^{\circ}\text{C}$	0.031 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$	
	(260 to 300) $^{\circ}\text{C}$	0.093 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.11 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.12 $^{\circ}\text{C}$	
	Pt 385, 500 Ω		
	(-200 to -80) $^{\circ}\text{C}$	0.031 $^{\circ}\text{C}$	
	(-80 to 0) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$	
	(0 to 100) $^{\circ}\text{C}$	0.039 $^{\circ}\text{C}$	
	(100 to 260) $^{\circ}\text{C}$	0.047 $^{\circ}\text{C}$	
	(260 to 300) $^{\circ}\text{C}$	0.062 $^{\circ}\text{C}$	
	(300 to 400) $^{\circ}\text{C}$	0.062 $^{\circ}\text{C}$	
	(400 to 600) $^{\circ}\text{C}$	0.07 $^{\circ}\text{C}$	
	(600 to 630) $^{\circ}\text{C}$	0.085 $^{\circ}\text{C}$	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of RTD Indicating Devices – Source	Pt 385, 1 k Ω		Comparison to Fluke 5522A Multiproduct Calibrator
	(-200 to -80) °C	0.023 °C	
	(-80 to 0) °C	0.023 °C	
	(0 to 100) °C	0.031 °C	
	(100 to 260) °C	0.039 °C	
	(260 to 300) °C	0.047 °C	
	(300 to 400) °C	0.054 °C	
	(400 to 600) °C	0.054 °C	
	(600 to 630) °C	0.18 °C	
	Pt 3916, 100 Ω		
	(-200 to -190) °C	0.19 °C	
	(-190 to -80) °C	0.031 °C	
	(-80 to 0) °C	0.039 °C	
	(0 to 100) °C	0.047 °C	
	(100 to 260) °C	0.054 °C	
	(260 to 300) °C	0.062 °C	
	(300 to 400) °C	0.07 °C	
	(400 to 600) °C	0.078 °C	
	(600 to 630) °C	0.18 °C	
	Pt 3926, 100 Ω		
	(-200 to -80) °C	0.039 °C	
	(-80 to 0) °C	0.039 °C	
	(0 to 100) °C	0.054 °C	
	(100 to 300) °C	0.07 °C	
	(300 to 400) °C	0.078 °C	
	(400 to 630) °C	0.093 °C	
	PtNi 385, 120 Ω		
	(-80 to 0) °C	0.062 °C	
	(0 to 100) °C	0.062 °C	
	(100 to 260) °C	0.1 °C	
	Cu 427, 10 Ω		
	(-100 to 260) °C	0.23 °C	
DC Voltage – Generate	Up to 220 mV	9.1 μ V/V + 0.4 μ V	Comparison to Fluke 5720A Multiproduct Calibrator
	(0.22 to 2.2) V	5.7 μ V/V + 0.7 μ V	
	(2.2 to 11) V	4.4 μ V/V + 2.5 μ V	
	(11 to 22) V	4 μ V/V + 4 μ V	
	(22 to 220) V	6.3 μ V/V + 40 μ V	
	(220 to 1 000) V	7.6 μ V/V + 0.4 mV	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure	Up to 200 mV 200 mV to 20 V (20 to 200) V (200 to 1 000) V	5 μ V/V + 0.5 μ V 3.5 μ V/V + 0.2 μ V 5.5 μ V/V + 0.2 μ V 5.5 μ V/V + 0.5 μ V	Comparison to Fluke 8508A 8.5 Digit Reference Multimeter
DC High Voltage – Measure	(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	Comparison to \ Vitrek 4700 High Voltage Meter with Associated High Voltage Probes HVL-35, HVL-70, HVL-100
Electrical Simulation of pH Indicators	0 pH 1 pH 2 pH 3 pH 4 pH 5 pH 6 pH 7 pH 8 pH 9 pH 10 pH 11 pH 12 pH 13 pH 14 pH	0.000 091 pH 0.000 082 pH 0.000 093 pH 0.000 077 pH 0.000 061 pH 0.000 045 pH 0.000 029 pH 0.000 013 pH 0.000 029 pH 0.000 045 pH 0.000 061 pH 0.000 077 pH 0.000 093 pH 0.000 082 pH 0.000 091 pH	Comparison to Fluke 5522A Multiproduct Calibrator
Electrical Simulation of Thermocouple Indicating Devices – Measure/Source	Type B (250 to 350) °C (350 to 445) °C (445 to 580) °C (580 to 750) °C (750 to 1 000) °C (1 000 to 1 820) °C	1.2 °C 0.9 °C 0.71 °C 0.55 °C 0.45 °C 0.35 °C	Comparison to Ectron 1140A Thermocouple Calibrator/Simulator

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	Type C		Comparison to Ectron 1140A Thermocouple Calibrator/Simulator
	(0 to 250) °C	0.21 °C	
	(250 to 1 000) °C	0.17 °C	
	(1 000 to 1 500) °C	0.19 °C	
	(1 500 to 1 800) °C	0.22 °C	
	(1 800 to 2 000) °C	0.24 °C	
	(2 000 to 2 250) °C	0.3 °C	
	(2 250 to 2 315) °C	0.33 °C	
	Type E		
	(-270 to -245) °C	1.6 °C	
	(-245 to -195) °C	0.24 °C	
	(-195 to -155) °C	0.12 °C	
	(-155 to -90) °C	0.095 °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 G		
	(0 to 100) °C	1.6 °C	
	(100 to 300) °C	0.5 °C	
	(300 to 600) °C	0.35 °C	
	(600 to 1 760) °C	0.18 °C	
	(1 760 to 2 030) °C	0.2 °C	
	(2 030 to 2 200) °C	0.25 °C	
	(2 200 to 2 315) °C	0.27 °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	

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	Type N		Comparison to Ectron 1140A Thermocouple Calibrator/Simulator
	(-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 PL II		
	0 to 100) °C	0.1 °C	
	(100 to 925) °C	0.085 °C	
	(925 to 1 200) °C	0.1 °C	
	(1 200 to 1 395) °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	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase – Source	(0 to 90)° (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 5522A Multiproduct Calibrator
Oscilloscopes			
Amplitude DC into 50 Ω load into 1 M Ω load	(-6.6 to 6.6) V (-130 to 130) V	0.22 % of reading + 31 μ V 0.12 % of reading + 31 μ V	
Amplitude Square Wave into 50 Ω load into 1 M Ω load	10 Hz to 10 kHz 1 mVp-p to 6.6 Vp-p 10 Hz to 1 kHz 1 mVp-p to 130 Vp-p (1 to 10) kHz 1 mVp-p to 130 Vp-p	0.22 % of reading + 31 μ V 0.14 % of reading + 31 μ V 0.19 % of reading + 31 μ V	
Timing – Generate into 50 Ω load	1 ns to 20 ms 50 ms 100 ms 200 ms 500 ms 1 s 2 s 5 s	0.000 22 % reading 0.005 9 % reading 0.009 8 % reading 0.018 % reading 0.041 % reading 0.08 % reading 0.16 % reading 0.39 % reading	Comparison to Fluke 5522A/1100 Multiproduct Calibrator
Rise Time – Generate 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	51 ps 51 ps	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes Leveled Sine Wave – Generate into 50 Ω load	5 mVp-p to 5.5 Vp-p 50 kHz 100 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	Comparison to Fluke 5522A/1100 Multiproduct Calibrator
Bandwidth/Flatness – Measure (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 MHz to 1.1 GHz	1.4 % of reading + 78 μ V 1.8 % of reading + 78 μ V 3.2 % of reading + 78 μ V 4 % of reading + 78 μ V	
Input Impedance – Measure into 50 Ω load into 1 M Ω load	(40 to 60) Ω (0.5 to 1.5) M Ω	0.082 % of reading 0.081 % of reading	
Input Capacitance – Measure	(5 to 50) pF	3.9 % of reading + 0.39 pF	
Wave Generator – Source Amplitude (Sine, Square, Triangle) into 50 Ω load into 1 M Ω 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 μ V 2.3 % of reading + 78 μ V	
Frequency	10 Hz to 10 kHz	0.0019 % of reading + 12 mHz	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Cylindrical Ring Gages ²	(0.04 to 0.25) in (> 0.25 to 4) in (> 4 to 14) in (1 to 6.4) mm (> 6.4 to 100) mm (> 100 to 350) mm	(12 + 3.3L) μin (11 + 3.3L) μin (18 + 3.3L) μin (0.31 + 3.3L) μm (0.29 + 3.3L) μm (0.45 + 3.3L) μm	Comparison to Universal Length Measuring Machine, Master Cylindrical Rings
Micrometer End Standards ²	(1 to 4) in (> 4 to 12) in (25 to 100) mm (> 100 to 300) mm	(9 + 3L) μin (10 + 3.3L) μin (0.62 + 3L) μm (0.63 + 3.3L) μm	Direct measure using Universal Length Measuring Machine
Thread Plugs ² Pitch Diameter Major Diameter	Up to 1 in (> 1 to 10) in Up to 25 mm (> 25 to 250) mm Up to 1 in (> 1 to 10) in Up to 25 mm (> 25 to 250) mm	(83 + 2.1L) μin (83 + 2.7L) μin (2.1 + 2.1L) μm (2.1 + 2.5L) μm (43 + 2.1L) μin (43 + 2.7L) μin (1 + 2.1L) μm (1 + 2.5L) μm	Comparison to P&W Supermicrometer® Model C, Master Thread Wires
Pin Gages ²	(0.004 to 1) in (0.1 to 25.4) mm	(29 + 2.1L) μin (0.82 + 2.1L) μm	Comparison to Laser Micrometer, Master Discs
Master Discs ²	(0.01 to 4) in (> 4 to 10) in (0.25 to 100) mm (> 100 to 250) mm	(6 + 2.7L) μin (8 + 2.7L) μin (0.6 + 2.8L) μm (0.61 + 2.8L) μm	Direct measure using Universal Length Measuring Machine
Calipers ² Travel (Outside, Inside, Depth, Step)	Up to 64 in	(50 + 2.9L) μin	Comparison to Gage Blocks
Indicators ² (Dial, Digital, Drop, Snap)	Up to 12 in Up to 300 mm	(15 + 44L) μin (0.46 + 44L) μm	Comparison to Gage Blocks
Test Indicators ²	Up to 10 in Up to 250 mm	(10 + 2.8L) μin (0.26 + 2.8L) μm	Comparison to Universal Length Measuring Machine

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Outside Micrometers ² Travel	Up to 36 in	$(12 + 2.8L) \mu\text{in}$	Comparison to Gage Blocks
Anvil Flatness	Up to 1 inD	$6.4 \mu\text{in}$	Optical Flats
Anvil Parallelism	Up to 1 in (1 to 36) in	$13 \mu\text{in}$ $(8 + 0.2L) \mu\text{in}$	Optical Parallels

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic Pressure – Absolute	(1.5 to 5.8) psi (5.8 to 29) psi (29 to 100) psi (100 to 200) psi (200 to 1 000) psi	0.000 93 psi 0.01 % of reading + 0.000 058 psi 0.01 % of reading + 0.000 58 psi 0.036 psi 0.01 % of reading + 0.005 8 psi	Comparison to Pneumatic Pressure Calibrator
Pneumatic Low Pressure – Gauge	(-1 to 1) inH ₂ O	0.001 4 inH ₂ O	Comparison to Pneumatic Pressure Calibrator
Pneumatic Pressure – Gauge	(-13.2 to -7.4) psi 7.4 to 15 psi 15 to 20 psi 20 to 100 psi 100 to 200 psi 200 to 1000 psi	0.000 93 psi 0.01 % of reading + 0.000 058 psi 0.003 7 psi 0.01 % of reading + 0.000 58 psi 0.036 psi 0.01 % of reading + 0.005 8 psi	Comparison to Pneumatic Pressure Calibrator
Hydraulic Pressure – Gauge	(1 000 to 3 000) psi (3 000 to 30 000) psi	0.02 % of reading + 0.51 psi 0.02 % of reading + 1.4 psi	Comparison to Hydraulic Pressure Calibrator
Torque Devices	Up to 17.5 lbf·in (17.5 to 100) lbf·in (100 to 1 000) lbf·in 1 000 lbf·in to 73 lbf·ft (73 to 295) lbf·ft (295 to 600) lbf·ft (600 to 1 000) lbf·ft	0.33 % of reading + 0.13 lbf·in 0.66 % of reading + 0.058 lbf·in 0.66 % of reading + 0.058 lbf·in 0.67 % of reading + 0.005 8 lbf·ft 0.68 % of reading + 0.005 8 lbf·ft 0.66 % of reading + 0.058 lbf·ft 0.66 % of reading + 0.058 lbf·ft	Comparison to Torque Calibration System

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pipettes, Burettes, Diluters, Dispensers, Repeaters, Syringes, Controllers, Fillers	(0.1 to 1) μ l	10 nL	Gravimetric method per ISO 8655 using Electronic Balances.
	(1 to 10) μ l	12 nL	
	(10 to 20) μ l	13 nL	
	(20 to 100) μ l	25 nL	
	(100 to 200) μ l	45 nL	
	(200 to 500) μ l	0.21 μ L	
	(0.5 to 1) ml	0.29 μ L	
	(1 to 5) ml	1.8 μ L	
	(5 to 10) ml	2.4 μ L	
	(10 to 50) ml	6.6 μ L	
	(50 to 100) ml	8.6 μ L	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Generate	(-10 to 15) $^{\circ}$ C		Comparison to Thunder Scientific 2500 Humidity Generator
	(10 to 75) %RH	0.5 %RH	
	(75 to 95) %RH	0.65 %RH	
	(15 to 35) $^{\circ}$ C		
	(10 to 95) %RH	0.5 %RH	
	(35 to 70) $^{\circ}$ C		
	(10 to 50) $^{\circ}$ C	0.5 %RH	
Humidity – Measure	(50 to 75) $^{\circ}$ C	0.7 %RH	Comparison to Humidity Meter with Probe
	(75 to 95) $^{\circ}$ C	0.85 %RH	
	(-40 to -20) $^{\circ}$ C		
	Up to 100 %RH	0.015 % of reading + 1.6 %RH	
	(-20 to 15) $^{\circ}$ C		
	Up to 100 %RH	0.008 % of reading + 1.1 %RH	
	(15 to 25) $^{\circ}$ C		
	Up to 90 %RH	1.1 %RH	
	(90 to 100) %RH	1.8 %RH	
	(25 to 40) $^{\circ}$ C		
	Up to 100 %RH	0.008 % of reading + 1.1 %RH	
	(40 to 180) $^{\circ}$ C		
	Up to 100 %RH	0.015 % of reading + 1.6 %RH	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature – Generate	(-95 to 140) °C (140 to 350) °C	0.068 °C 0.006 3 % of reading + 0.13 °C	Comparison to Fluke 1524 Reference Thermometer, Accumac AM1730 Secondary PRT, Fluke 9190A Field Metrology Well
Temperature – Measure	(-195 to 110) °C (110 to 420) °C	0.029 °C 0.006 3 % of reading + 0.022 °C	Comparison to Fluke 1524 Reference Thermometer, Accumac AM1730 Secondary PRT
Infrared Thermometers	(-15 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 120) °C	0.58 °C 0.66 °C 0.79 °C 0.85 °C	Comparison to Fluke 4180 Blackbody Source (flat plate) $\lambda = (8 \text{ to } 14) \mu\text{m}$, $\epsilon = (0.9 \text{ to } 1)$
Infrared Thermometers	(120 to 200) °C (200 to 350) °C (250 to 500) °C	1.1 °C 1.9 °C 2.4 °C	Comparison to Fluke 4181 Blackbody Source (flat plate) $\lambda = (8 \text{ to } 14) \mu\text{m}$, $\epsilon = (0.9 \text{ to } 1)$

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Reference	10 MHz	0.23 mHz	Comparison to GPS Disciplined Rubidium Oscillator
Frequency – Source	1 to 20 MHz	58 nHz/Hz	Comparison to Agilent 33220A Function Generator, GPS Disciplined Rubidium Oscillator

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Generate	20 MHz to 3 GHz	1.2 Hz	Comparison to Keysight E4432B RF Signal Generator, GPS Disciplined Rubidium Oscillator
Frequency – Measure	1 Hz to 1 kHz 1 kHz to 10 MHz 10 MHz to 5 GHz	1.5 nHz/Hz + 5.5 μ Hz 1.9 nHz/Hz + 4 μ Hz 1.8 nHz/Hz	Comparison to Agilent 53132A Universal Counter, GPS Disciplined Rubidium Oscillator
Period – Generate	(1 to 100) s	58 ns/s	Comparison to Agilent 33220A Function Generator, GPS Disciplined Rubidium Oscillator
Period – Measure	(1 to 10) s (10 to 100) s	1.7 μ s 5.3 μ s	Comparison to Agilent 53132A Universal Counter, GPS Disciplined Rubidium Oscillator
Non-Contact Rotation – Measure ²	(2.5 to 9.999) rpm (10 to 99.999) rpm (100 to 999.99) rpm (1 000 to 9 999.9) rpm (10 000 to 99 999) rpm	0.001 3 rpm 0.012 % of reading + 0.000 58 rpm 0.012 % of reading + 0.005 8 rpm 0.012 % of reading + 0.058 rpm 0.012 % of reading + 0.58 rpm	Comparison to Optical Tachometer
Stopwatches	Up to 19.99 s/day	59 ms/day	Comparison to Helmut Klein 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:

- The values in the Range column are Nominal values. The certified values will be utilized at the time of calibration, along with the associated Measurement Uncertainty (MU).
- L = length in inches or millimeters depending on the unit of measure for the measurand; D = diameter; rpm = revolutions per minute.
- Unless otherwise specified in the far-right column, the calibration method/procedure utilized by the laboratory was developed and validated internally.
- The legal entity of the laboratory is Transcat, Inc.



Jason Stine, Vice President