



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat - Cleveland
9325 Progress Parkway, Suite B
Mentor, OH 44060

Fulfills the requirements of

ISO/IEC 17025:2017

and national standard

ANSI/NCSL Z540-1-1994 (R2002)

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.

A handwritten signature in black ink, appearing to be 'Jason Stine', is positioned above a horizontal line.

Jason Stine, Vice President

Expiry Date: 07 September 2025

Certificate Number: AC-1287



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)

Transcat - Cleveland

9325 Progress Parkway, Suite B
 Mentor, OH 44060
 Kyle Pillar 440-853-1900
 Email: kyle.pillar@transcat.com

CALIBRATION

Valid to: **September 7, 2025**

Certificate Number: **AC-1287**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Measure ^{1,3}	Up to 100 mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 500) V (500 to 800) V (800 to 1 000) V	6.6 $\mu\text{V/V} + 0.46 \mu\text{V}$ 4.5 $\mu\text{V/V} + 0.46 \mu\text{V}$ 4.5 $\mu\text{V/V} + 0.61 \mu\text{V}$ 6.8 $\mu\text{V/V} + 30 \mu\text{V}$ 10 $\mu\text{V/V} + 0.1 \text{ mV}$ 14 $\mu\text{V/V} + 0.1 \text{ mV}$ 19 $\mu\text{V/V} + 0.1 \text{ mV}$	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
DC High Voltage – Measure ^{1,3}	(1 to 10) kV	1.7 V/kV + 0.1 V	Comparison to Ross VD15 Voltage Divider, HP 34401A 6.5 Digit Multimeter
DC High Voltage – Measure ^{1,3}	(10 to 60) kV	1.6 V/kV + 0.2 V	Comparison to Ross VD60 Voltage Divider, HP 34401A 6.5 Digit Multimeter
DC High Voltage – Measure ^{1,3}	(60 to 141) kV	1.8 V/kV + 8.8 V	Comparison to Ross VMP200 Voltage Divider, Fluke 187 Digital Multimeter



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Voltage – Source ^{1,3}	Up to 330 mV (0.33 to 3.3) V (3.3 to 33) V (33 to 330) V (330 to 1 020) V	16 μ V/V + 0.78 μ V 9 μ V/V + 1.6 μ V 10 μ V/V + 16 μ V 15 μ V/V + 0.12 mV 14 μ V/V + 1.2 mV	Comparison to Fluke 5522A Multiproduct Calibrator
DC Current – Measure ^{1,3}	Up to 100 nA (0.1 to 1) μ A (1 to 10) μ A (10 to 100) μ A (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	36 μ A/A + 0.04 nA 29 μ A/A + 0.04 nA 29 μ A/A + 0.1 nA 23 μ A/A + 0.8 nA 24 μ A/A + 5 nA 26 μ A/A + 50 nA 38 μ A/A + 0.5 μ A 0.011 % of reading + 10 μ A	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
DC Current – Measure ^{1,3}	(1 to 14) A (14 to 30) A	1.5 mA 2.1 mA	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter, IET DCCS-0.01 and DCCS-0.001 Current Shunts
DC Current – Source ^{1,3}	Up to 330 μ A (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 20.5) A	0.12 mA/A + 16 nA 82 μ A/A + 39 nA 98 μ A/A + 0.19 μ A 78 μ A/A + 1.9 μ A 0.16 mA/A + 31 μ A 0.3 mA/A + 31 μ A 0.51 mA/A + 0.39 mA 0.93 mA/A + 0.58 mA	Comparison to Fluke 5522A Multiproduct Calibrator
DC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor ^{1,3}	(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 Fluke 5522A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Current Coil



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ^{1,3}	100 μ V to 10 mV		Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
	(1 to 40) Hz	0.037 % of reading + 3 μ V	
	40 Hz to 1 kHz	0.029 % of reading + 1.1 μ V	
	(1 to 20) kHz	0.035 % of reading + 1.1 μ V	
	(20 to 50) kHz	0.1 % of reading + 1.1 μ V	
	(50 to 100) kHz	0.5 % of reading + 1.1 μ V	
	(100 to 300) kHz	4 % of reading + 2 μ V	
	300 kHz to 1 MHz	1.2 % of reading + 5 μ V	
	(1 to 4) MHz	7 % of reading + 7 μ V	
	(4 to 8 MHz)	20 % of reading + 8 μ V	
	(10 to 100) mV		
	(1 to 40) Hz	0.012 % of reading + 4 μ V	
	40 Hz to 1 kHz	0.008 5 % of reading + 2 μ V	
	(1 to 20) kHz	0.014 % of reading + 2 μ V	
	(20 to 50) kHz	0.03 % of reading + 2 μ V	
	(50 to 100) kHz	0.08 % of reading + 2 μ V	
	(100 to 300) kHz	0.3 % of reading + 10 μ V	
	300 kHz to 1 MHz	1 % of reading + 10 μ V	
	(1 to 2) MHz	1.5 % of reading + 10 μ V	
	(2 to 4) MHz	4 % of reading + 70 μ V	
	(4 to 8) MHz	4 % of reading + 80 μ V	
	(8 to 10) MHz	15 % of reading + 0.1 mV	
	(0.1 to 1) V		
	(1 to 40) Hz	0.007 8 % of reading + 40 μ V	
40 Hz to 1 kHz	0.007 3 % of reading + 20 μ V		
(1 to 20) kHz	0.014 % of reading + 20 μ V		
(20 to 50) kHz	0.03 % of reading + 20 μ V		
(50 to 100) kHz	0.08 % of reading + 20 μ V		
(100 to 300) kHz	0.3 % of reading + 0.1 mV		
300 kHz to 1 MHz	1 % of reading + 0.1 mV		
(1 to 2) MHz	1.5 % of reading + 0.1 mV		
(2 to 4) MHz	4 % of reading + 0.7 mV		
(4 to 8) MHz	4 % of reading + 0.8 mV		
(8 to 10) MHz	15 % of reading + 1 mV		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ^{1,3}	(1 to 10) V (1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 8) MHz (8 to 10) MHz (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	0.007 5 % of reading + 0.4 mV 0.007 5 % of reading + 0.2 mV 0.014 % of reading + 0.2 mV 0.03 % of reading + 0.2 mV 0.08 % of reading + 0.2 mV 0.3 % of reading + 1 mV 1 % of reading + 1 mV 1.5 % of reading + 1 mV 4 % of reading + 7 mV 4 % of reading + 8 mV 15 % of reading + 10 mV 0.021 % of reading + 4 mV 0.02 % of reading + 2 mV 0.02 % of reading + 2 mV 0.035 % of reading + 2 mV 0.12 % of reading + 2 mV 0.4 % of reading + 10 mV 1.5 % of reading + 10 mV 0.041 % of reading + 40 mV 0.041 % of reading + 20 mV 0.06 % of reading + 20 mV 0.12 % of reading + 20 mV 0.3 % of reading + 20 mV	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
AC High Voltage – Measure ^{1,3}	(0.7 to 10) kV 60 Hz	7.2 V/kV + 2.9 V	Comparison to Ross VD15 Voltage Divider, HP 34401A 6.5 Digit Multimeter
AC High Voltage – Measure ^{1,3}	(10 to 42) kV 60Hz	6.2 V/kV + 7.9 V	Comparison to Ross VD60 Voltage Divider, HP 34401A 6.5 Digit Multimeter
AC High Voltage – Measure ^{1,3}	(42 to 106) kV 60 Hz	16 V/kV + 6 V	Comparison to Ross VMP200 Voltage Divider, Fluke 187 Digital Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment	
AC Voltage – Source ^{1,3}	100 μ V to 33 mV	0.065 % of reading + 4.7 μ V	Comparison to Fluke 5522A Multiproduct Calibrator	
	(10 to 45) Hz	0.014 % of reading + 4.7 μ V		
	45 Hz to 10 kHz	(10 to 20) kHz		0.017 % of reading + 4.7 μ V
	(10 to 20) kHz	(20 to 50) kHz		0.079 % of reading + 4.7 μ V
	(20 to 50) kHz	(50 to 100) kHz		0.27 % of reading + 9.3 μ V
	(50 to 100) kHz	(100 to 500) kHz		0.62 % of reading + 39 μ V
	(100 to 500) kHz	(33 to 330) mV		(10 to 45) Hz
	(33 to 330) mV	(10 to 45) Hz		0.027 % of reading + 6.2 μ V
	(10 to 45) Hz	45 Hz to 10 kHz		0.012 % of reading + 6.2 μ V
	45 Hz to 10 kHz	(10 to 20) kHz		0.013 % of reading + 6.2 μ V
	(10 to 20) kHz	(20 to 50) kHz		0.027 % of reading + 6.2 μ V
	(20 to 50) kHz	(50 to 100) kHz		0.062 % of reading + 25 μ V
	(50 to 100) kHz	(100 to 500) kHz		0.16 % of reading + 54 μ V
	(100 to 500) kHz	(0.33 to 3.3) V		(10 to 45) Hz
	(0.33 to 3.3) V	(10 to 45) Hz		0.027 % of reading + 39 μ V
	(10 to 45) Hz	45 Hz to 10 kHz		0.012 % of reading + 47 μ V
	45 Hz to 10 kHz	(10 to 20) kHz		0.015 % of reading + 47 μ V
	(10 to 20) kHz	(20 to 50) kHz		0.024 % of reading + 39 μ V
	(20 to 50) kHz	(50 to 100) kHz		0.055 % of reading + 49 μ V
	(50 to 100) kHz	(100 to 500) kHz		0.19 % of reading + 0.47 mV
	(100 to 500) kHz	(3.3 to 33) V		(10 to 45) Hz
	(3.3 to 33) V	(10 to 45) Hz		0.027 % of reading + 0.5 mV
	(10 to 45) Hz	45 Hz to 10 kHz		0.012 % of reading + 0.47 mV
	45 Hz to 10 kHz	(10 to 20) kHz		0.019 % of reading + 0.47 mV
	(10 to 20) kHz	(20 to 50) kHz		0.027 % of reading + 0.47 mV
	(20 to 50) kHz	(50 to 100) kHz		0.7 % of reading + 1.2 mV
	(50 to 100) kHz	(33 to 330) V		45 Hz to 1 kHz
	(33 to 330) V	45 Hz to 1 kHz		0.015 % of reading + 1.6 mV
45 Hz to 1 kHz	(1 to 10) kHz	0.016 % of reading + 4.7 mV		
(1 to 10) kHz	(10 to 20) kHz	0.02 % of reading + 4.7 mV		
(10 to 20) kHz	(20 to 50) kHz	0.025 % of reading + 4.7 mV		
(20 to 50) kHz	(50 to 100) kHz	0.16 % of reading + 39 mV		
(50 to 100) kHz	(330 to 1 020) V	45 Hz to 1 kHz		
(330 to 1 020) V	45 Hz to 1 kHz	0.023 % of reading + 7.8 mV		
45 Hz to 1 kHz	(1 to 5) kHz	0.02 % of reading + 7.8 mV		
(1 to 5) kHz	(5 to 10) kHz	0.023 % of reading + 7.8 mV		
(5 to 10) kHz				

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ^{1,3}	(29 to 330) μ A		Comparison to Fluke 5522A Multiproduct Calibrator
	(10 to 20) Hz	0.16 % of reading + 80 nA	
	(20 to 45) Hz	0.12 % of reading + 80 nA	
	45 Hz to 1 kHz	0.097 % of reading + 80 nA	
	(1 to 5) kHz	0.23 % of reading + 0.12 μ A	
	(5 to 10) kHz	0.62 % of reading + 0.16 μ A	
	(10 to 30) kHz	1.2 % of reading + 0.31 μ A	
	(0.33 to 3.3) mA		
	(10 to 20) Hz	0.16 % of reading + 0.12 μ A	
	(20 to 45) Hz	0.097 % of reading + 0.12 μ A	
	45 Hz to 1 kHz	0.078 % of reading + 0.12 μ A	
	(1 to 5) kHz	0.16 % of reading + 0.16 μ A	
	(5 to 10) kHz	0.39 % of reading + 0.23 μ A	
	(10 to 30) kHz	0.78 % of reading + 0.47 μ A	
	(3.3 to 33) mA		
	(10 to 20) Hz	0.14 % of reading + 1.6 μ A	
	(20 to 45) Hz	0.071 % of reading + 1.6 μ A	
	45 Hz to 1 kHz	0.035 % of reading + 1.6 μ A	
	(1 to 5) kHz	0.064 % of reading + 1.6 μ A	
	(5 to 10) kHz	0.16 % of reading + 2.3 μ A	
	(10 to 30) kHz	0.31 % of reading + 3.1 μ A	
	(33 to 330) mA		
	(10 to 20) Hz	0.14 % of reading + 16 μ A	
	(20 to 45) Hz	0.071 % of reading + 16 μ A	
45 Hz to 1 kHz	0.033 % of reading + 16 μ A		
(1 to 5) kHz	0.078 % of reading + 39 μ A		
(5 to 10) kHz	0.16 % of reading + 78 μ A		
(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 μ A		
45 Hz to 1 kHz	0.04 % of reading + 78 μ A		
(1 to 5) kHz	0.47 % of reading + 0.78 mA		
(5 to 10) kHz	1.9 % of reading + 3.9 mA		
(1.1 to 3) A			
(10 to 45) Hz	0.14 % of reading + 78 μ A		
45 Hz to 1 kHz	0.049 % of reading + 78 μ A		
(1 to 5) kHz	0.47 % of reading + 0.78 mA		
(5 to 10) kHz	1.9 % of reading + 3.9 mA		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ^{1,3}	(3 to 11) A (10 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.049 % of reading + 1.6 mA 0.079 % of reading + 1.6 mA 2.3 % of reading + 1.6 mA	Comparison to Fluke 5522A Multiproduct Calibrator
	(11 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	
AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor ^{1,3}	(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 5522A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Current Coil
AC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor ^{1,3}	(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 5522A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Current Coil
AC Current – Measure ^{1,3}	(5 to 100) μ A (10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz	0.4 % of reading + 30 nA 0.15 % of reading + 30 nA 0.064 % of reading + 30 nA	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
	(0.1 to 1) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % of reading + 0.2 μ A 0.15 % of reading + 0.2 μ A 0.062 % of reading + 0.2 μ A 0.034 % of reading + 0.2 μ A	
	(1 to 10) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % of reading + 2 μ A 0.15 % of reading + 2 μ A 0.062 % of reading + 2 μ A 0.034 % of reading + 2 μ A	
	(10 to 100) mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % of reading + 20 μ A 0.15 % of reading + 20 μ A 0.062 % of reading + 20 μ A 0.034 % of reading + 20 μ A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ^{1,3}	(0.1 to 1) A (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.4 % of reading + 0.2 mA 0.16 % of reading + 0.2 mA 0.087 % of reading + 0.2 mA 0.14 % of reading + 0.2 mA	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
AC Current – Measure ^{1,3}	(1 to 3) A 60 Hz 400 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz (3 to 10) A 60 Hz 400 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz (10 to 30) A 60 Hz 400 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz (30 to 50) A 60 Hz 400 Hz 1 kHz 10 kHz 20 kHz 50 kHz 100 kHz	0.8 mA 1.2 mA 1.4 mA 1.1 mA 1.4 mA 7.2 mA 8.2 mA 5.5 mA 6.3 mA 6.7 mA 9.4 mA 9.7 mA 29 mA 48 mA 7.5 mA 12 mA 14 mA 11 mA 14 mA 72 mA 82 mA 18 mA 19 mA 20 mA 28 mA 31 mA 0.13 A 0.17 A	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter, Precision Measurements 9810 Current Shunt
Inductance – Source ¹ (Fixed Artifacts)	1 kHz 50 μH 1 mH 5 H	0.32 μH 2 μH 14 mH	Comparison to GenRad Standard Inductors

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Inductance – Measure ¹	1 kHz 100 μH to 1 mH (1 to 10) mH (10 to 100) mH 100 mH to 1 H (1 to 10) H	0.2 nH 2.4 μH 2.4 μH 0.24 mH 2.4 mH	Comparison to GenRad 1689 RLC Bridge
Capacitance – Measure ¹	1 kHz Up to 1 nF (1 to 10) nF (10 to 100) nF (0.1 to 1) μF (1 to 1.111) μF	0.2 pF 2.4 pF 24 pF 0.24 nF 0.29 nF	Comparison to GenRad 1689 RLC Bridge
Capacitance – Source ^{1,3} (Simulation)	(220 to 400) pF 10 Hz to 10 kHz (0.4 to 1.1) nF 10 Hz to 10 kHz (1.1 to 3.3) nF 10 Hz to 3 kHz (3.3 to 11) nF 10 Hz to 1 kHz (11 to 33) nF 10 Hz to 1 kHz (33 to 110) nF 10 Hz to 1 kHz (110 to 330) nF 10 Hz to 1 kHz (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	0.4 % of reading + 7.8 pF 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 0.38 % of reading + 0.23 μF	Comparison to Fluke 5522A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Capacitance – Source ^{1,3} (Simulation)	(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	0.35 % 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
DC Resistance – Source ^{1,3} (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 12 % of reading + 0.39 MΩ	Comparison to Fluke 5522A Multiproduct Calibrator
DC Resistance – Source ^{1,3} (Simulation)	(11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ (0.33 to 1.1) GΩ	0.19 mΩ/Ω + 1.9 kΩ 0.41 mΩ/Ω + 2.3 kΩ 0.23 % of reading + 78 kΩ 12 % of reading + 0.39 MΩ	Comparison to Fluke 5522A Multiproduct Calibrator
DC Resistance – Source ^{1,3} (Fixed Artifacts)	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ 1 TΩ 10 TΩ	27 mΩ 12 Ω 2.7 Ω 31 Ω 0.65 kΩ 0.12 MΩ 5.9 MΩ 59 MΩ 1.2 GΩ 23 GΩ 0.58 TΩ	Comparison to IET VRS-100-10-1K-BP High Resistance Standard Set



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance – Measure ^{1,3}	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	16 μΩ/Ω + 50 μΩ 14 μΩ/Ω + 0.5 mΩ 12 μΩ/Ω + 0.5 mΩ 12 μΩ/Ω + 5 mΩ 13 μΩ/Ω + 50 mΩ 17 μΩ/Ω + 2 Ω 58 μΩ/Ω + 0.1 kΩ 0.052 % of reading + 1 kΩ 0.5 % of reading + 10 kΩ	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
AC Resistance – Measure ^{1,3}	60 Hz 8 mΩ 23 mΩ	1.7 μΩ 4.2 μΩ	Comparison to Precision Measurements 9810/9830 Shunts
Oscilloscopes ¹ Amplitude – DC into 50 Ω load into 1 MΩ load Amplitude – Square Wave into 50 Ω load into 1 MΩ load Time Markers into 50 Ω load	(-6.6 to 6.6) V (-130 to 130) V 1 mVp-p to 6.6 Vp-p 10 Hz to 10 kHz 1 mVp-p to 130 Vp-p 10 Hz to 1 kHz (1 to 10) kHz 1 ns to 20 ns 50 ns 100 ns 200 ns 500 ns 1 μs 2 μs 5 μs	0.22 % of reading + 31 μV 0.12 % of reading + 31 μV 0.22 % of reading + 31 μV 0.078 % of reading + 31 μV 0.19 % of reading + 31 μV 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/SC1100 Multiproduct Calibrator



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ¹ Rise Time into 50 Ω load Rate: 1 kHz to 2 MHz Rate: (2 to 10) MHz	5 mVp-p to 2.5 Vp-p (200 to 300) ps (250 to 350) ps	50 ps 50 ps	Comparison to Fluke 5522A/SC1100 Multiproduct Calibrator
Leveled Sine Wave 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 % of reading + 0.23 mV 5.5 % of reading + 0.23 mV	
Bandwidth/Flatness (50 kHz Reference) into 50 Ω load	5 mVp-p to 5.5 Vp-p 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5 mVp-p to 3.5 Vp-p 600 MHz to 1.1 GHz	1.4 % of reading + 78 μV 1.8 % of reading + 78 μV 3.2 % of reading + 78 μV 4 % of reading + 78 μV	
Input Impedance – Measure into 50 Ω load into 1 MΩ load	(40 to 60) Ω (0.5 to 1.5) MΩ	0.082 % of reading 0.081 % of reading	
Input Capacitance – Measure	(5 to 50) pF	3.9 % of reading + 0.39 pF	
Wave Generator – Amplitude (Sine, Square, Triangle) into 50 Ω load into 1 MΩ load	10 Hz to 10 kHz 1.8 mVp-p to 2.5 Vp-p 1.8 mVp-p to 55 Vp-p	2.3 % of reading + 78 μV 2.3 % of reading + 78 μV	
Frequency	10 Hz to 10 kHz	0.001 9 % of reading + 12 mHz	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure ^{1,3}	Type B		Comparison to Fluke 5522A Multiproduct Calibrator
	(600 to 800) °C	0.35 °C	
	(800 to 1 000) °C	0.28 °C	
	(1 000 to 1 550) °C	0.24 °C	
	(1 550 to 1 820) °C	0.26 °C	
	Type C		
	(0 to 150) °C	0.24 °C	
	(150 to 650) °C	0.21 °C	
	(650 to 1 000) °C	0.24 °C	
	(1 000 to 1 800) °C	0.39 °C	
	(1 800 to 2 316) °C	0.65 °C	
	Type E		
	(-250 to -100) °C	0.39 °C	
	(-100 to -25) °C	0.13 °C	
	(-25 to 350) °C	0.12 °C	
	(350 to 650) °C	0.13 °C	
	(650 to 1 000) °C	0.17 °C	
	Type J		
	(-210 to -100) °C	0.21 °C	
	(-100 to -30) °C	0.13 °C	
	(-30 to 150) °C	0.12 °C	
	(150 to 760) °C	0.14 °C	
	(760 to 1 200) °C	0.18 °C	
	Type K		
(-200 to -100) °C	0.26 °C		
(-100 to -25) °C	0.15 °C		
(-25 to 120) °C	0.13 °C		
(120 to 1 000) °C	0.21 °C		
(1 000 to 1 372) °C	0.31 °C		
Type L			
(-200 to -100) °C	0.29 °C		
(-100 to 800) °C	0.21 °C		
(800 to 900) °C	0.14 °C		
Type N			
(-200 to -100) °C	0.31 °C		
(-100 to -25) °C	0.18 °C		
(-25 to 120) °C	0.15 °C		
(120 to 410) °C	0.15 °C		
(410 to 1 300) °C	0.21 °C		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Electrical Simulation of Thermocouple Indicating Devices – Source/Measure ^{1,3}	Type R		Comparison to Fluke 5522A Multiproduct Calibrator
	(0 to 250) °C	0.46 °C	
	(250 to 400) °C	0.29 °C	
	(400 to 1 000) °C	0.26 °C	
	(1 000 to 1 767) °C	0.32 °C	
	Type S		
	(0 to 250) °C	0.45 °C	
	(250 to 1 000) °C	0.3 °C	
	(1 000 to 1 400) °C	0.29 °C	
	(1 400 to 1 767) °C	0.36 °C	
	Type T		
	(-250 to -150) °C	0.49 °C	
	(-150 to 0) °C	0.19 °C	
	(0 to 120) °C	0.13 °C	
(120 to 400) °C	0.12 °C		
Type U			
(-200 to 0) °C	0.44 °C		
(0 to 600) °C	0.21 °C		
Electrical Simulation of RTD Indicating Devices – Source ^{1,3}	Pt 385, 100 Ω		Comparison to Fluke 5522A Multiproduct Calibrator
	(-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	
	(630 to 800) °C	0.18 °C	
	Pt 385, 200 Ω		
	-200 to -80) °C	0.031 °C	
	(-80 to 0) °C	0.031 °C	
	(0 to 100) °C	0.031 °C	
	(100 to 260) °C	0.039 °C	
	(260 to 300) °C	0.093 °C	
	(300 to 400) °C	0.1 °C	
	(400 to 600) °C	0.11 °C	
	(600 to 630) °C	0.12 °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 ^{1,3}	Pt 385, 500 Ω		Comparison to Fluke 5522A Multiproduct Calibrator
	(-200 to -80) °C	0.031 °C	
	(-80 to 0) °C	0.039 °C	
	(0 to 100) °C	0.039 °C	
	(100 to 260) °C	0.047 °C	
	(260 to 300) °C	0.062 °C	
	(300 to 400) °C	0.062 °C	
	(400 to 600) °C	0.07 °C	
	(600 to 630) °C	0.085 °C	
	Pt 385, 1 000 Ω		
	(-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	0.018 °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		



ANSI National Accreditation Board

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Phase Angle – Source ^{1,3}	(0 to 90)°		Comparison to Fluke 5522A Multiproduct Calibrator
	(10 to 65) Hz	0.11°	
	(65 to 500) Hz	0.21°	
	500 Hz to 1 kHz	0.39°	
	(1 to 5) kHz	1.9°	
	(5 to 10) kHz	3.9°	
	(10 to 30) kHz	7.8°	

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
RF Power – Measure ^{1,3,4} Up to 26.5 GHz	(-70 to -30) dBm		Comparison to Agilent 4418B Power Meter, Agilent 8842A Power Sensor, Agilent 8485D Power Sensor
	50 MHz to 8 GHz	0.15 dB	
	(8 to 20) GHz	0.2 dB	
	(20 to 26.5) GHz	0.22 dB	
	(-30 to +10) dBm		
	100 kHz to 2.5 GHz	0.04 dB	
	(2.5 to 4.2) GHz	0.09 dB	
	(4.2 to 13) GHz	0.12 dB	
RF Power – Measure ^{1,3,4}	(13 to 18) GHz	0.14 dB	Comparison to Agilent 4418B Power Meter, Agilent 8482A/8485A Power Sensors
	(18 to 26.5) GHz	0.16 dB	
	(10 to 20) dBm		
	100 kHz to 2.5 GHz	0.16 dB	
	(2.5 to 4.2) GHz	0.18 dB	
Amplitude Modulation – Measure ^{1,3}	(4.2 to 13) GHz	0.19 dB	Comparison to HP 8902A Measuring Receiver
	(18 to 26.5) GHz	0.21 dB	
	(5 to 99) % Depth		
Frequency Modulation – Measure ^{1,3}	150 kHz to 10 MHz	2.4 % Depth	Comparison to HP 8902A Measuring Receiver
	10 MHz to 1.3 GHz	1.2 % Depth	
	(5 to 99) % Deviation		
Phase Modulation – Measure ^{1,3}	150 kHz to 10 MHz	2.4 % of reading	Comparison to HP 8902A Measuring Receiver
	10 MHz to 1.3 GHz	1.2 % of reading	
	(5 to 99) % Deviation		
Phase Modulation – Measure ^{1,3}	150 kHz to 10 MHz	3.6 % of reading	Comparison to HP 8902A Measuring Receiver
	10 MHz to 1.3 GHz	3.6 % of reading	
	(5 to 99) % Deviation		

Electrical – RF/Microwave

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Tuned RF Level Attenuation – Measure ^{1,3,4}	2.5 MHz to 1.3 GHz (-10 to 0) dBm (-20 to -10) dBm (-30 to -20) dBm (-40 to -30) dBm (-50 to -40) dBm (-60 to -50) dBm (-70 to -60) dBm (-80 to -70) dBm (-90 to -80) dBm (-100 to -90) dBm (-120 to -100) dBm	0.04 dB 0.05 dB 0.07 dB 0.08 dB 0.1 dB 0.11 dB 0.13 dB 0.15 dB 0.16 dB 0.18 dB 0.19 dB	Comparison to HP 8902A Measuring Receiver, HP 11722A Power Sensor
Harmonics – Measure ^{1,3}	DC Coupled (-80 to 0) dB 30 Hz to 6.5GHz AC Coupled (-80 to 0) dB 100 kHz to 6.5 GHz	2.1 dB 2.4 dB	Comparison to HP 8561E Spectrum Analyzer
AM Distortion – Measure ^{1,3}	(-80 to 0) dB 20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.4 dB	Comparison to HP 8903B Audio Analyzer
FM Distortion – Measure ^{1,3}	(-80 to 0) dB 20Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.4 dB	Comparison to HP 8903B Audio Analyzer

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Length Standards	Up to 4 in (4 to 10) in (10 to 20) in	(10 + 5.8L) μin (14 + 8.8L) μin (21 + 7L) μin	Comparison to Universal Length Measuring Machine, Grade 0 Gage Block Set



ANSI National Accreditation Board

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,2} Outside Diameter 0.000 5 in Resolution Parallelism, ID, Depth, Step 0.000 5 in Resolution	Up to 4 in (4 to 20) in (20 to 40) in (40 to 48) in Up to 1 in	(9.2 + 6L) μin (23 + 5.8L) μin (21 + 6.5L) μin (2 + 7L) μin 220 μin	Comparisons to Gage Blocks, Gage Block Accessory Set, Surface Plate, Master Gage Pins
Inside Micrometers ^{1,2}	Up to 4 in (5 to 20) in (24 to 40) in (44 to 48) in	(53 + 2.2L) μin (52 + 4.3L) μin (37 + 5.7L) μin (44 + 5.7L) μin	Comparison to Gage Blocks, Gage Block Accessory Set (ID)
Anvil Flatness	Up to 1 in	5.9 μin	Comparison to Optical Flats
Outside Micrometers ^{1,2}	Up to 1 in (1 to 4) in (4 to 20) in (20 to 40) in	15 μin (9.6 + 5.5L) μin (24 + 5.3L) μin (24 + 5.9L) μin	Comparison to Gage Blocks
Depth Gages ^{1,2} (Micrometer/Indicator)	Up to 4 in (5 to 20) in (24 to 40) in (44 to 48) in	(73 + 4L) μin (87 + 5.5L) μin (69 + 4.1L) μin (94 + 4L) μin	Comparison to Gage Blocks, Surface Plate
Dial/Digital Indicators ^{1,2}	Up to 4 in	(74 + 1.7L) μin	Comparison to Gage Blocks, Surface Plate
Height Gages ^{1,2,3}	Up to 20 in (20 to 40) in (40 to 48) in	(75 + 3.3L) μin (42 + 5.8L) μin (43 + 5.8L) μin	Comparison to Gage Blocks, Surface Plate
Laser Micrometers ¹	0.25 in 0.5 in 0.75 in 1 in	20 μin 22 μin 24 μin 31 μin	Comparisons to XX Master Pin Gages
Rules, Scales, Tape Measures	Up to 48 in	0.009 1 in	Comparison to Gage Blocks, Surface Plate

Mass and Mass-Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pressure Gages, Pressure Transducers ^{1,3}	(0.2 to 50) psia	0.001 2 % of reading	Comparison to Ruska 2465A Piston Gauge
	(0.2 to 50) psig	0.001 2 % of reading	
Pressure Gages, Pressure Transducers ^{1,3}	(29 to 300) psia	0.14 % of reading	Comparison to Druck DPI-145 Pressure Indicator
Pressure Gages, Pressure Transducers ^{1,3}	Up to 160 psig (160 to 1 300) psig	0.026 psi 0.007 % of reading + 0.02 psi	Comparison to Mansfield and Green TD-4000N Deadweight Tester (Low Piston)
Pressure Gages, Pressure Transducers ^{1,3}	(1 300 to 13 000 psig)	0.007 5 % of reading + 0.02 psi	Comparison to Mansfield and Green TD-4000N Deadweight Tester (High Piston)
Vacuum ^{1,3}	(-15 to 50) psi	0.001 2 % of reading	Comparison to Ruska 2465A Piston Gauge
Volumetric Flow ^{1,3}	(5 to 500) sccm	0.24 % of reading	Comparison to DryCal ML-800-10 and DryCal ML-800-44 Flow Cells
	500 sccm to 50 slpm	0.24 % of reading	
Volumetric Flow ^{1,3}	(0.7 to 7) scfm	0.1 % of reading + 0.025 scfm	Comparison to Cox 16-064, Cox 16-121, and Cox 16-228 Sonic Nozzles
	(7 to 25) scfm	0.1 % of reading + 0.14 scfm	
	(25 to 90) scfm	0.1 % of reading + 0.36 scfm	
Pipettes ³	(10 to 20) µl	65 nl	Comparison to A&D 4212B-101 Balance and Software
	(20 to 50) µl	66 nl	
	(50 to 100) µl	69 nl	
	(100 to 200) µl	80 nl	
	(200 to 500) µl	0.14 µl	
(500 to 1 000) µl	0.24 µl		
Torque Transducers ^{1,3}	(0.5 to 10) lbf·in	0.03 % of reading + 0.000 1 lbf·in	Comparison to NIST Class F Weights, 4 in Torque Wheel
Torque Transducers ^{1,3}	(10 to 1 920) lbf·in	0.018 % of reading + 0.000 1 lbf·in	Comparison to NIST Class F Weights, 10 in Torque Wheel

Mass and Mass-Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Transducers ^{1,3}	(160 to 1 000) lbf·ft	0.24 % of reading + 0.01 lbf·ft	Comparison to NIST Class F Weights, 4 ft Torque Arm
Torque Drivers, Torque Indicators ^{1,3}	(5 to 50) ozf·in (50 to 200) ozf·in (4 to 400) lbf·in	1.5 % of reading 1. % of reading 0.6 % of reading	Comparison to CDI Torque Measuring System
Torque Wrenches ^{1,3}	4 lbf·in to 600 lbf·ft	0.46 % of reading	Comparison to CDI Torque Measuring System
Torque Tools ^{1,3}	(600 to 1 000) lbf·ft	1.3 % of reading	Comparison to Norbar Pro Test 1500ER (43189)
Force ^{1,3} (Compression & Tension)	Up to 50 lbf	0.006 lbf	Comparison to NIST Class F Weights
Force ^{1,3} (Compression & Tension)	(50 to 1 000) lbf	0.31 lbf	Comparison to 1 000 lbf Interface Load Cell
Force ^{1,3} (Compression & Tension)	(1 000 to 10 000) lbf	2.5 lbf	Comparison to 10 000 lbf Interface Load Cell
Force ^{1,3} (Compression & Tension)	(10 000 to 50 000) lbf	13 lbf	Comparison to 50 000 lbf Interface Load Cell
Force ^{1,3} (Compression & Tension)	Up to 20 lb (20 to 50) lb (50 to 100) lb (100 to 200) lb (200 to 400) lb (400 to 600) lb	1.5 g 3.8 g 7.5 g 15 g 30 g 45 g	Comparison to NIST Class F Weights
Balances and Scales ^{1,5} (SI)	Up to 2 g (2 to 5) g (5 to 10) g (10 to 20) g (20 to 50) g (50 to 100) g (100 to 200) g (200 to 300) g (300 to 400) g (400 to 500) g	21 µg 22 µg 33 µg 51 µg 94 µg 0.2 mg 0.39 mg 0.43 mg 0.77 mg 0.94 mg	ASTM E617 Ultra Class weights and NIST HB 44 utilized in the calibration of the weighing system.

Mass and Mass-Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Balances and Scales ^{1,5} (SI)	(500 to 600) g (600 to 800) g (0.8 to 1) kg	0.96 mg 1.1 mg 1.3 mg	ASTM E617 Ultra Class weights and NIST HB 44 utilized in the calibration of the weighing system.
Balances and Scales ^{1,5} (SI)	Up to 0.5 g (0.5 to 5) g (5 to 10) g (10 to 20) g (20 to 30) g (30 to 50) g 50 g to 26 kg (26 to 45) kg	13 µg 42 µg 62 µg 92 µg 0.12 mg 0.19 mg 0.000 33 % of reading 89 mg	ASTM E617 Class 1 weights and NIST HB 44 utilized in the calibration of the weighing system.
Balances and Scales ^{1,5} (SI)	Up to 10 mg (10 to 20) mg (20 to 50) mg (50 to 100) mg (100 to 200) mg (200 to 500) mg (0.5 to 1) g (1 to 2) g (2 to 5) g (5 to 10) g (10 to 15) g (15 to 20) g (20 to 40) g	36 µg 42 µg 51 µg 60 µg 72 µg 96 µg 0.12 mg 0.16 mg 0.22 mg 0.3 mg 0.38 mg 0.43 mg 0.002 1 % of reading	ASTM E617 Class 3 weights and NIST HB 44 utilized in the calibration of the weighing system.
Balances and Scales ^{1,5} (Avoirdupois)	Up to 0.01 lb (0.01 to 2) lb (2 to 600) lb	0.000 004 lb 0.024 % of reading 0.013 % of reading	NIST Class F weights and NIST HB 44 utilized in the calibration of the weighing system.

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure ^{1,3}	(15 to 25) °C Up to 90 %RH (90 to 95) %RH	1.3 %RH 2 %RH	Comparison to Vaisala HMT/HMP-333 Transmitter

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Source ^{1,3} (Humidity Measuring Devices)	Up to 30 %RH (30 to 90) %RH	1.4 %RH 2 %RH	Comparison to Vaisala HMT/HMP-363 Transmitter, Thermotron SM-1.5-8200 Environmental Chamber
Humidity – Source ^{1,3,6} (Humidity Measuring Devices)	11.3 %RH 32.9 %RH 75.4 %RH 96.7 %RH	1.3 %RH 1.3 %RH 1.3 %RH 2.2 %RH	Comparison to Vaisala HMT/HMP-363 Transmitter, Saturated Salt Solutions
Temperature – Measure ^{1,3}	(-196 to 0) °C (0 to 420) °C	0.033 °C 0.01 % of reading + 0.042 °C	Comparison to Burns Eng 12005 SPRT, Hart 1521 Digital Thermometer
Temperature – Source ^{1,3} (Temperature Measuring Instruments)	(-40 to 0) °C (0 to 160) °C (160 to 400) °C	0.068 °C 0.02 % of reading + 0.06 °C 0.05 % of reading + 0.1 °C	Comparison to Additel 878-160 Drywell Calibrator, Omega DBCL400 Drywell Calibrator, Burns Eng 12005 SPRT, Hart 1521 Digital Thermometer

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Reference ^{1,3}	10 MHz	6.5 mHz	Comparison to SRS FS725 Rubidium Frequency Standard
Frequency – Source ^{1,3}	1 μHz to 250 kHz	1.9 μHz/Hz	Comparison to Agilent 33220A Signal Generator, SRS FS725 Rubidium Frequency Standard



ANSI National Accreditation Board


Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Source ^{1,3}	250 kHz to 3 GHz	0.92 nHz/Hz	Comparison to HP ESG-D3000A Signal Generator, SRS FS725 Rubidium Frequency Standard
Frequency – Source ^{1,3} (Sine Wave)	10 mHz to 2 MHz	2 μHz/Hz + 8 μHz	Comparison to Fluke 5522A Multiproduct Calibrator
Frequency – Measure ^{1,3}	1 Hz to 10 kHz 10 kHz to 10 MHz (10 to 225) MHz	1.6 nHz/Hz + 4.6 μHz 1.6 nHz/Hz + 0.18 mHz 1.6 nHz/Hz + 3.5 mHz	Comparison to Agilent 53131A Universal Counter, SRS FS725 Rubidium Frequency Standard
Frequency – Measure ^{1,3}	(225 to 500) MHz 500 MHz to 26.5 GHz	14 nHz/Hz + 1.2 Hz 12 nHz/Hz + 1.2 Hz	Comparison to HP 5348A Microwave Counter SRS FS725 Rubidium Frequency Standard
Frequency – Measure ^{1,3}	(1 to 40) Hz 40 Hz to 10 MHz	0.05 % of reading 0.01 % of reading	Comparison to HP 3458A Opt 002 8.5 Digit Multimeter
Stopwatches/Timers	Up to 24 hr	61 ms/d	NIST 960-12 Time Base Method utilizing Timometer
AC Duty Cycle – Source ¹ Square Wave: < 3.3 Vp-p Freq: 0.1 Hz 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 5522A Multiproduct Calibrator

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. L = length in inches.
3. Uncertainties do not include contributors from a “best available” unit under test.
4. The uncertainty does not include the mismatch uncertainty. This will be determined and reported at time of calibration. The reported uncertainty will be higher than listed.
5. The uncertainties for scales and balances are highly dependent upon the resolution of the unit under test. The uncertainties presented here do not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
6. The values in the Range column are Nominal values. The certified values and their inherent uncertainties will be utilized at the time of calibration.
7. The legal entity name for this client is Transcat, Inc.
8. Unless otherwise specified in the far-right column, the calibration procedure/method utilized by the laboratory was internally written.
9. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-1287.



Jason Stine, Vice President

