



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat – Palm Beach Gardens

**10415 Riverside Drive
Palm Beach Gardens, FL 33410**

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.

A handwritten signature in black ink, appearing to read 'R. Douglas Leonard Jr.', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 07 September 2023
Certificate Number: AC-2489.25



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 – Palm Beach Gardens

10415 Riverside Drive

Palm Beach Gardens, FL 33410

Wesley Gonzalez 561-494-3510

CALIBRATION

Valid to: **September 7, 2023**

Certificate Number: **AC-2489.25**

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	50 mA to 1 A (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (1 to 3) A (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz	0.37 % of reading + 0.27 mA 0.2 % of reading + 0.27 mA 0.072 % of reading + 0.27 mA 0.74 % of reading + 1.2 mA 0.24 % of reading + 1.2 mA 0.11 % of reading + 1.2 mA	Agilent 34401A 6.5 Digit Multimeter
AC Current – Source ¹	(29 to 330) μ 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 330 μ A 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	0.16 % of reading + 80 nA 0.12 % of reading + 80 nA 0.097 % of reading + 80 nA 0.23 % of reading + 0.12 μ A 0.62 % of reading + 0.16 μ A 1.2 % of reading + 0.3 μ A 0.16 % of reading + 0.12 μ A 0.097 % of reading + 0.12 μ A 0.078 % of reading + 0.12 μ A 0.16 % of reading + 0.16 μ A 0.39 % of reading + 0.23 μ A 0.78 % of reading + 0.47 μ A	Fluke 5522A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(3.3 to 33) mA (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 (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 330 mA 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 (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (11 to 20.5) A (45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.14 % of reading + 1.6 μ A 0.071 % of reading + 1.6 μ A 0.035 % of reading + 1.6 μ A 0.064 % of reading + 1.6 μ A 0.16 % of reading + 2.3 μ A 0.31 % of reading + 3.1 μ A 0.14 % of reading + 16 μ A 0.071 % of reading + 16 μ A 0.033 % of reading + 16 μ A 0.078 % of reading + 39 μ A 0.16 % of reading + 78 μ A 0.31 % of reading + 0.16 mA 0.14 % of reading + 78 μ A 0.04 % of reading + 78 μ A 0.47 % of reading + 0.78 mA 1.9 % of reading + 3.9 mA 0.14 % of reading + 78 μ A 0.049 % of reading + 78 μ A 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 0.12 % of reading + 3.9 mA 2.3 % of reading + 3.9 mA	Fluke 5522A Multiproduct Calibrator
AC Voltage – Measure ¹	Up to 100 mV (3 to 5) Hz (5 to 10) Hz (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	0.67 % of reading + 27 μ V 0.24 % of reading + 27 μ V 0.057 % of reading + 27 μ V 0.047 % of reading + 27 μ V 0.043 % of reading + 27 μ V 0.085 % of reading + 33 μ V 0.41 % of reading + 53 μ V 2.7 % of reading + 0.33 mV	Agilent 34401A 6.5 Digit Multimeter

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	100 mV to 1 V		Agilent 34401A 6.5 Digit Multimeter
	(3 to 5) Hz	0.67 % of reading + 0.2 mV	
	(5 to 10) Hz	0.24 % of reading + 0.2 mV	
	(10 to 20) Hz	0.051 % of reading + 0.2 mV	
	(20 to 40) Hz	0.044 % of reading + 0.2 mV	
	40 Hz to 20 kHz	0.041 % of reading + 0.2 mV	
	(20 to 50) kHz	0.081 % of reading + 0.33 mV	
	(50 to 100) kHz	0.4 % of reading + 0.53 mV	
	(100 to 300) kHz	2.7 % of reading + 3.3 mV	
	(1 to 10) V		
	(3 to 5) Hz	0.67 % of reading + 2 mV	
	(5 to 10) Hz	0.24 % of reading + 2 mV	
	(10 to 20) Hz	0.051 % of reading + 2 mV	
	(20 to 40) Hz	0.044 % of reading + 2 mV	
	40 Hz to 20 kHz	0.04 % of reading + 2 mV	
	(20 to 50) kHz	0.081 % of reading + 3.3 mV	
	(50 to 100) kHz	0.4 % of reading + 5.3 mV	
	(100 to 300) kHz	2.7 % of reading + 33 mV	
	(10 to 100) V		
	(3 to 5) Hz	0.67 % of reading + 20 mV	
	(5 to 10) Hz	0.24 % of reading + 20 mV	
	(10 to 20) Hz	0.051 % of reading + 20 mV	
	(20 to 40) Hz	0.042 % of reading + 20 mV	
	40 Hz to 20 kHz	0.041 % of reading + 20 mV	
(20 to 50) kHz	0.081 % of reading + 33 mV		
(50 to 100) kHz	0.4 % of reading + 53 mV		
(100 to 300) kHz	2.7 % of reading + 0.33 V		
(100 to 750) V			
(3 to 5) Hz	0.67 % of reading + 0.15 V		
(5 to 10) Hz	0.23 % of reading + 0.15 V		
(10 to 40) Hz	0.042 % of reading + 0.15 V		
40 Hz to 1 kHz	0.042 % of reading + 0.15 V		
(1 to 20) kHz	0.044 % of reading + 0.15 V		
(20 to 30) kHz	0.1 % of reading + 0.2 V		
(30 to 50) kHz	0.1 % of reading + 0.2 V		
(50 to 100) kHz	0.46 % of reading + 0.4 V		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Source ¹	(1 to 33) mV		Fluke 5522A Multiproduct Calibrator
	(10 to 45) Hz	0.065 % of reading + 4.7 μ V	
	45 Hz to 10 kHz	0.014 % of reading + 4.7 μ V	
	(10 to 20) kHz	0.017 % of reading + 4.7 μ V	
	(20 to 50) kHz	0.079 % of reading + 4.7 μ V	
	(50 to 100) kHz	0.27 % of reading + 9.3 μ V	
	(100 to 500) kHz	0.62 % of reading + 39 μ V	
	(33 to 330) mV		
	(10 to 45) Hz	0.027 % of reading + 6.2 μ V	
	45 Hz to 10 kHz	0.012 % of reading + 6.2 μ V	
	(10 to 20) kHz	0.013 % of reading + 6.2 μ V	
	(20 to 50) kHz	0.027 % of reading + 6.2 μ V	
	(50 to 100) kHz	0.062 % of reading + 25 μ V	
	(100 to 500) kHz	0.16 % of reading + 54 μ V	
	330 mV to 3.3 V		
	(10 to 45) Hz	0.027 % of reading + 39 μ V	
	45 Hz to 10 kHz	0.012 % of reading + 47 μ V	
	(10 to 20) kHz	0.015 % of reading + 47 μ V	
	(20 to 50) kHz	0.024 % of reading + 39 μ V	
	(50 to 100) kHz	0.055 % of reading + 49 μ V	
	(100 to 500) kHz	0.19 % of reading + 0.47 mV	
(3.3 to 33) V			
(10 to 45) Hz	0.027 % of reading + 0.5 mV		
45 to 10 kHz	0.012 % of reading + 0.47 mV		
(10 to 20) kHz	0.019 % of reading + 0.47 mV		
(20 to 50) kHz	0.027 % of reading + 0.47 mV		
(50 to 100) kHz	0.07 % of reading + 1.2 mV		
(33 V to 330) V			
45 Hz to 1 kHz	0.015 % of reading + 1.6 mV		
(1 to 10) kHz	0.016 % of reading + 4.7 mV		
(10 to 20) kHz	0.02 % of reading + 4.7 mV		
(20 to 50) kHz	0.025 % of reading + 4.7 mV		
(50 to 100) kHz	0.16 % of reading + 39 mV		
(330 to 1 000 V)			
45 Hz to 1 kHz	0.023 % of reading + 7.8 mV		
(1 to 5) kHz	0.02 % of reading + 7.8 mV		
(5 to 10) kHz	0.023 % of reading + 7.8 mV		
DC Current – Measure ¹	Up to 10 mA	0.034 % of reading + 1.3 μ A	Agilent 34401A 6.5 Digit Multimeter
	(10 to 100) mA	0.034 % of reading + 3.3 μ A	
	100 mA to 1 A	0.067 % of reading + 67 μ A	
	(1 to 3) A	0.08 % of reading + 0.4 mA	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Source	Up to 330 μ A 330 μ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A	0.012 % of reading + 16 nA 0.008 2 % of reading + 39 nA 0.009 8 % of reading + 0.19 μ A 0.007 8 % of reading + 1.9 μ A 0.016 % of reading + 31 μ A 0.03 % of reading + 31 μ A 0.051 % of reading + 0.39 mA 0.093 % of reading + 0.58 mA	Fluke 5522A Multiproduct Calibrator
DC Voltage – Measure ¹	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	0.003 6 % of reading + 2.3 μ V 0.002 7 % of reading + 4.7 μ V 0.002 4 % of reading + 33 μ V 0.003 % of reading + 0.4 mV 0.003 1 % of reading + 6.7 mV	Agilent 34401A 6.5 Digit Multimeter
DC Voltage – Source	(33 to 330) mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V (330 to 1 000) V	0.001 6 % of reading + 0.78 μ V 0.000 9 % of reading + 1.6 μ V 0.001 % of reading + 16 μ V 0.001 5 % of reading + 0.12 mV 0.001 5 % of reading + 1.2 mV	Fluke 5522A Multiproduct Calibrator
Resistance – Measure ¹ (4-wire)	Up to 100 Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω	0.006 8 % of reading + 2.7 m Ω 0.006 8 % of reading + 6.7 m Ω 0.006 8 % of reading + 67 m Ω 0.006 8 % of reading + 0.67 Ω 0.007 1 % of reading + 6.7 Ω 0.028 % of reading + 67 Ω	Agilent 34401A 6.5 Digit Multimeter
(2-wire)	(10 to 100) M Ω	0.54 % of reading + 6.7 k Ω	
Resistance – Source ¹ (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 111) Ω (110 to 330) Ω 330 Ω 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 330 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω	0.003 2 % of reading + 0.78 m Ω 0.002 4 % of reading + 1.2 m Ω 0.002 2 % of reading + 1.1 m Ω 0.002 2 % of reading + 1.6 m Ω 0.002 2 % of reading + 1.6 m Ω 0.002 2 % of reading + 1.6 m Ω 0.002 2 % of reading + 1.6 m Ω 0.002 2 % of reading + 0.16 Ω 0.002 2 % of reading + 0.16 Ω 0.002 7 % of reading + 1.6 Ω 0.002 6 % of reading + 1.6 Ω 0.006 6 % of reading + 23 Ω 0.01 % of reading + 39 Ω 0.019 % of reading + 1.9 k Ω	Fluke 5522A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Resistance – Source ¹ (Simulation)	(33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	0.041 % of reading + 2.3 kΩ 0.23 % of reading + 78 kΩ 12 % of reading + 0.39 MΩ	Fluke 5522A Multiproduct Calibrator
Capacitance – Source ¹ (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 3 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 (0.33 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	0.4 % 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 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	Fluke 5522A Multiproduct Calibrator

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	Type B		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 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 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		
Type R			
(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		

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	Type S (0 to 250) °C (250 to 1 000) °C (1 000 to 1 400) °C (1 400 to 1 767) °C Type T (-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.45 °C 0.3 °C 0.29 °C 0.36 °C 0.49 °C 0.19 °C 0.13 °C 0.12 °C	Fluke 5522A Multiproduct Calibrator
Electrical Simulation of RTD Indicating Devices – Source ¹	Pt 385, 100 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C Pt 385, 200 Ω -200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C Pt 385, 500 Ω (-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.039 °C 0.039 °C 0.054 °C 0.07 °C 0.078 °C 0.093 °C 0.18 °C 0.031 °C 0.031 °C 0.031 °C 0.039 °C 0.093 °C 0.1 °C 0.11 °C 0.12 °C 0.031 °C 0.039 °C 0.039 °C 0.047 °C 0.062 °C 0.062 °C 0.07 °C 0.085 °C	Fluke 5522A Multiproduct Calibrator

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	Pt 385, 1 000 Ω		Fluke 5522A Multiproduct Calibrator
	(-200 to -80) °C	0.023 °C	
	(-80 to 0) °C	0.031 °C	
	(0 to 100) °C	0.039 °C	
	(100 to 260) °C	0.047 °C	
	(260 to 300) °C	0.054 °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		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Power – Source ¹ 330 μ W to 330 mA 330 mA to 3 A (3 to 20.5) A	11 μ W to 1.1 mW	0.024 % of reading	Fluke 5522A Multiproduct Calibrator
	(1.1 to 110) mW	0.027 % of reading	
	110 mW to 110 W	0.024 % of reading	
	(110 to 330) W	0.018 % of reading	
	11 μ W to 110 mW	0.044 % of reading	
	110 mW to 990 W	0.053 % of reading	
	1 W to 3 kW	0.009 6 % of reading	
	99 mW to 0.99 W	0.088 % of reading	
	0.99 W to 6.8 kW	0.07 % of reading	
6.8 W to 20.5 kW	0.04 % of reading		
AC Power – Source ^{1,2} PF = 1 (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA 330 mA to 0.9 A (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	(10 to 65) Hz (0.11 mW to 3) mW	0.13 % of reading	Fluke 5522A Multiproduct Calibrator
	3 mW to 9 W	0.077 % of reading	
	(10 to 65) W (0.3 to 10) mW	0.089 % of reading	
	10 mW to 33 W	0.077 % of reading	
	(10 to 65) Hz (1 to 30) mW	0.071 % of reading	
	30 mW to 90 W	0.057 % of reading	
	(10 to 65) Hz (3 to 100) mW	0.089 % of reading	
	100 mW to 300 W	0.078 % of reading	
	(10 to 65) Hz (11 to 300) mW	0.071 % of reading	
	300 mW to 900 W	0.081 % of reading	
	(10 to 65) Hz 30 mW to 0.72 W	0.089 % of reading	
	0.72 W to 2 kW	0.079 % of reading	
	(10 to 65) Hz 80 mW to 1.4 W	0.088 % of reading	
	1.4 W to 4.5 kW	0.18 % of reading	
	(10 to 65) Hz 150 mW to 6.7 W	0.17 % of reading	
	6.7 W to 20 kW	0.17 % of reading	



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ^{1,3} Leveled Sine Wave into 50 Ω load	5 mVp-p to 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 4.7 % of reading + 0.23 mV	Fluke 5522A/6 Multiproduct Calibrator w/ 600 MHz Scope Option
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	1.4 % of reading + 78 μV 1.8 % of reading + 78 μV 3.2 % of reading + 78 μV	
Input Impedance – Measure	(40 to 60) Ω 500 kΩ 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	
Waveform Generator (Sine, Square, Triangle) Amplitude 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	0.0019 % of reading + 12 mHz	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ^{1,4,6} Travel (Outside, Inside, Depth, Step) Jaw Flatness Jaw Parallelism	(0.05 to 1) in (1 to 9) in (4 to 15) in (15 to 40) in Up to 1 inD Up to 1 inD	(13 + 1L) μin (9 + 4L) μin (14 + 4L) μin (20 + 4L) μin 6 μin 59 μin	Gage Blocks, Long Gage Blocks Optical Flats Gage Pins
Micrometers ^{1,4,6} Travel (Outside, Inside, Depth) Anvil Flatness Anvil Parallelism	(0.05 to 1) in (1 to 9) in (4 to 15) in (15 to 40) in Up to 1 inD Up to 1 inD	(13 + 1L) μin (9 + 4L) μin (14 + 4L) μin (20 + 4L) μin 6.3 μin 6.3 μin	Gage Blocks, Long Gage Blocks Optical Flats Optical Parallels
Indicators ^{1,4} Digital, Dial, Drop, Test	(0.05 to 1) in (1 to 5) in	62 μin (60 + 2L) μin	Gage Blocks, Test Stand
Length Measurements ⁴ Outside Dimension	Up to 1 in (1 to 10) in	34 μin (34 + 3.3L) μin	Super-micrometer Model C
Thread Wires	(2 to 120) TPI (0.008 to 0.5) in	35 μin	Super-micrometer Model C
Cylindrical Plug Gages ⁴ (Outside Diameter)	Up to 1 in (1 to 6) in	35 μin (35 + 2.5L) μin	Super-micrometer Model C
Pin Gages (Outside Diameter)	(0.01 to 0.04) in (0.04 to 0.5) in (0.5 to 1) in (1 to 2) in	40 μin 39 μin 39 μin 41 μin	Non-contact Method using Laser Micrometer.
Optical Comparators ^{1,4} Length Squareness	Up to 8 in (0.04 to 1) in	(100 + 14L) μin (120 + 1.5L) μin	Calibration Grids Calibration Grids

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gages ⁴ Pitch Diameter, 60° Thread	Up to 1 in (1 to 4) in (4 to 7) in	88 µin 85 µin 93 µin	Master Thread Wires, Super-micrometer Model C
Major Diameter	Up to 1 in (1 to 7) in	36 µin (36 + 3L) µin	
Step Height	Up to 1 in	62 µin	
Thread Ring Gages Inner Pitch Diameter	Up to 1 in (1 to 4) in (4 to 7) in	88 µin 85 µin 93 µin	Master Plug Gage Uncertainty

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Torque Devices ¹ (Wrenches, Drivers, Indicators)	(3 to 80) ozf·in (30 to 800) ozf·in (2 to 60) cN·m (20 to 600) cN·m (0.2 to 5) lbf·in (2 to 50) lbf·in (44 to 440) lbf·in	3.6 % of reading + 0.005 8 ozf·in 3.6 % of reading + 0.058 ozf·in 3.6 % of reading + 0.005 8 cN·m 3.6 % of reading + 0.058 cN·m 3.6 % of reading + 0.000 58 lbf·in 3.6 % of reading + 0.005 8 lbf·in 1.2 % of reading + 0.58 lbf·in	Torque Calibrators, Torque Transducers
Scales and Balances ^{1,5} SI	(1 to 5) g (5 to 10) g (10 to 40) g (40 to 500) g (500 to 700) g (700 to 900) g (900 to 1 050) g	40 µg 60 µg 0.000 45 % of reading 0.000 31 % of reading 1.6 mg 1.7 mg 1.8 mg	ASTM E617 Class 1 weights and internal calibration procedure utilized in the calibration of the weighing system.
Scales and Balances ^{1,5} Avoirdupois	(0.5 to 375) lb	0.012 % of reading	ASTM E617 Class 6 weights and internal calibration procedure utilized in the calibration of the weighing system.
SI	0.23 g to 172 kg	0.012 % of reading	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pneumatic Pressure Devices	(-0.9 to 2.5) bar (-26.5 to 73.7) inHg@0 °C (-13 to 36.3) psig (0 to 25) bar (0 to 363) psig	0.83 mbar 0.025 inHg 0.012 psi 6.2 mbar 0.09 psi	Additel ADT761-M Pressure Controller/Calibrator

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Humidity – Measure ¹	(15 to 25) °C (10 to 90) %RH (90 to 98) %RH	1.3 %RH 2 %RH	Comparison to Master Thermohygrometer

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Frequency – Measure ¹	100 mV to 750 V (3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40 Hz to 100 kHz 100 mV to 100) V 100 to 300) kHz	0.067 % of reading 0.033 % of reading 0.02 % of reading 0.006 7 % of reading 0.006 7 % of reading	Agilent 34401A 6.5 Digit Multimeter
Frequency – Source ¹ Sine Wave	10 mHz to 2 MHz	0.000 2 % of reading + 8 μHz	Fluke 5522A Multiproduct Calibrator
Stopwatches/Timers	Up to 599 s/mon	58 ms/d	Vibrograf TM-4500 Timometer

Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
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	0.62 % of reading + 78 ns	Fluke 5522A Multiproduct Calibrator
	(10 to 49) % Duty Cycle 10 μs to 100 s	0.039 % of reading + 78 ns	
	50 % Duty Cycle 10 μs to 100 s	0.001 6 % of reading + 78 ns	
	(51 to 90) % Duty Cycle 10 μs to 100 s	0.039 % of reading + 78 ns	
	(90 to 99) % Duty Cycle 10 μs to 100 s	0.62 % of reading + 78 ns	
	10 μs to 100 s	0.62 % of reading + 78 ns	

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. D = diameter; L = length in inches.
5. The CMC for scales and balances is highly dependent upon the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution will be included in the reported measurement uncertainty at the time of calibration.
6. The CMC presented here does not include the Resolution of the Device Under Test (DUT). The Resolution will be added at the time of calibration in the Measurement Uncertainty (MU).
7. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.25.



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