



CERTIFICATE OF ACCREDITATION

The ANSI National Accreditation Board

Hereby attests that

Transcat–Montreal
9900 Côte-de-Liesse
Montréal, QC H8T 1A1 Canada

Fulfills the requirements of

ISO/IEC 17025:2017

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: 07 September 2025

Certificate Number: AC-2489.28



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

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CALIBRATION

Valid to: **September 7, 2025**

Certificate Number: **AC-2489.28**

Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Acceleration – Dynamic Amplitude Sensitivity: 10 mV/g	(0.1 to 10) g (5 to 9) Hz (10 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5 000) Hz (5 001 to 9 999) Hz (10 to 15) kHz	2.2 % of reading 1.7 % of reading 1.3 % of reading 1.4 % of reading 1.7 % of reading 2.2 % of reading 3.7 % of reading	Air Bearing Calibration Shaker

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	Up to 100 µA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 100 µA to 1 mA (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % of reading + 35 nA 0.17 % of reading + 35 nA 0.072 % of reading + 35 nA 0.072 % of reading + 35 nA 0.46 % of reading + 0.23 µA 0.17 % of reading + 0.23 µA 0.071 % of reading + 0.23 µA 0.038 % of reading + 0.23 µA	Agilent 3458A 8.5 Digit Multimeter



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Measure ¹	(1 to 10) mA		Agilent 3458A 8.5 Digit Multimeter
	(10 to 20) Hz	0.46 % of reading + 2.3 μ A	
	(20 to 45) Hz	0.17 % of reading + 2.3 μ A	
	(45 to 100) Hz	0.071 % of reading + 2.3 μ A	
	100 Hz to 5 kHz	0.038 % of reading + 2.3 μ A	
	(10 to 100) mA		
	(10 to 20) Hz	0.48 % of reading + 23 μ A	
	(20 to 45) Hz	0.17 % of reading + 23 μ A	
	(45 to 100) Hz	0.071 % of reading + 23 μ A	
	100 Hz to 5 kHz	0.037 % of reading + 23 μ A	
	100 mA to 1 A		
	(10 to 20) Hz	0.46 % of reading + 0.23 mA	
	(20 to 45) Hz	0.19 % of reading + 0.23 mA	
	(45 to 100) Hz	0.097 % of reading + 0.23 mA	
	100 Hz to 5 kHz	0.12 % of reading + 0.23 mA	
AC Current – Measure ¹	3 Hz to 5 kHz		Keysight 34465A 6.5 Digit Multimeter
	(1 to 3) A	0.23% of reading + 1.2 mA	
	(3 to 5) A	0.15% of reading + 4 mA	
	(5 to 10) A	0.35% of reading + 4.1 mA	
AC Current – Source ¹	Up to 220 μ A		Fluke 5720A Multiproduct Calibrator
	(10 to 20) Hz	0.03 % of reading + 16 nA	
	(20 to 40) Hz	0.019 % of reading + 10 nA	
	40 Hz to 1 kHz	0.015 % of reading + 8 nA	
	(1 to 5) kHz	0.03 % of reading + 12 nA	
	(5 to 10) kHz	0.11 % of reading + 65 nA	
	(0.22 to 2.2) mA		
	(10 to 20) Hz	0.03 % of reading + 40 nA	
	(20 to 40) Hz	0.018 % of reading + 35 nA	
	40 Hz to 1 kHz	0.013 % of reading + 35 nA	
	(1 to 5) kHz	0.021 % of reading + 0.11 μ A	
	(5 to 10) kHz	0.11 % of reading + 0.65 μ A	
	(2.2 to 22) mA		
	(10 to 20) Hz	0.039 % of reading + 0.4 μ A	
	(20 to 40) Hz	0.018 % of reading + 0.35 μ A	
	40 Hz to 1 kHz	0.014 % of reading + 0.35 μ A	
	(1 to 5) kHz	0.021 % of reading + 0.55 μ A	
	(5 to 10) kHz	0.11 % of reading + 5 μ A	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Current – Source ¹	(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	0.033 % of reading + 4 μA 0.018 % of reading + 3.5 μA 0.014 % of reading + 2.5 μA 0.021 % of reading + 3.5 μA 0.11 % of reading + 10 μA 0.027 % of reading + 35 μA 0.046 % of reading + 80 μA 0.7 % of reading + 0.16 mA	Fluke 5720A Multiproduct Calibrator
AC Current – Source ¹	(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	Fluke 5720A Multiproduct Calibrator, Fluke 5725A Amplifier
AC Current – Source ¹	(11 to 20.5) A (45 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	Fluke 5522A Multiproduct Calibrator
AC Clamp-on Ammeters (Toroidal Type) Transformer Type Sensor ¹	(20 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 000) A (45 to 65) Hz (65 to 440) Hz	0.3 % of reading + 26 mA 0.83 % of reading + 47 mA 0.35 % of reading + 0.12 A 1.1 % of reading + 0.22 A	Fluke 5522A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
AC Clamp-on Ammeters (Non-Toroidal Type) Hall Effect Sensor ¹	(20 to 150) A (45 to 65) Hz (65 to 440) Hz (150 to 1 000) A (45 to 65) Hz (65 to 440) Hz	0.57 % of reading + 0.25 A 1 % of reading + 0.25 A 0.6 % of reading + 0.9 A 1.3 % of reading + 0.92 A	Fluke 5522A Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil
DC Clamp-on Ammeters (Non-Toroidal Type) Transformer Type Sensor ¹	(20 to 150) A (150 to 1 000) A	0.51 % of reading + 0.14 A 0.51 % of reading + 0.5 A	Fluke 5520A/1100 Multiproduct Calibrator, Fluke 5500A/COIL 50-turn Coil



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	Up to 10 mV		Agilent 3458A 8.5 Digit Multimeter
	(1 to 40) Hz	0.04 % of reading + 3.5 μ V	
	40 Hz to 1 kHz	0.03 % of reading + 1.2 μ V	
	(1 to 20) kHz	0.04 % of reading + 1.2 μ V	
	(20 to 50) kHz	0.15 % of reading + 1.2 μ V	
	(50 to 100) kHz	0.59 % of reading + 1.2 μ V	
	(100 to 300) kHz	4.6 % of reading + 2.3 μ V	
	300 kHz to 1 MHz	1.5 % of reading + 5.8 μ V	
	(1 to 4) MHz	8.1 % of reading + 8.1 μ V	
	(10 to 100) mV		
	(1 to 40) Hz	0.013 % of reading + 4.8 μ V	
	40 Hz to 1 kHz	0.009 7 % of reading + 2.3 μ V	
	(1 to 20) kHz	0.017 % of reading + 2.3 μ V	
	(20 to 50) kHz	0.038 % of reading + 2.3 μ V	
	(50 to 100) kHz	0.093 % of reading + 2.3 μ V	
	(100 to 300) kHz	0.36 % of reading + 12 μ V	
	300 kHz to 1 MHz	1.2 % of reading + 12 μ V	
	(1 to 2) MHz	1.8 % of reading + 12 μ V	
	(2 to 4) MHz	4.7 % of reading + 81 μ V	
	(4 to 8) MHz	4.7 % of reading + 92 μ V	
	(8 to 10) MHz	17 % of reading + 0.12 mV	
	(0.1 to 1) V		
	(1 to 40) Hz	0.008 8 % of reading + 46 μ V	
	40 Hz to 1 kHz	0.008 3 % of reading + 23 μ V	
(1 to 20) kHz	0.017 % of reading + 23 μ V		
(20 to 50) kHz	0.036 % of reading + 23 μ V		
(50 to 100) kHz	0.093 % of reading + 23 μ V		
(100 to 300) kHz	0.36 % of reading + 0.12 mV		
300 kHz to 1 MHz	1.2 % of reading + 0.12 mV		
(1 to 2) MHz	1.8 % of reading + 0.12 mV		
(2 to 4) MHz	4.6 % of reading + 0.81 mV		
(4 to 8) MHz	4.6 % of reading + 0.92 mV		
(8 to 10) MHz	17 % of reading + 1.2 mV		

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
AC Voltage – Measure ¹	(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	0.009 5 % of reading + 0.46 mV 0.002 3 % of reading + 0.23 mV 0.017 % of reading + 0.23 mV 0.036 % of reading + 0.23 mV 0.093 % of reading + 0.23 mV 0.36 % of reading + 1.2 mV 1.2 % of reading + 1.2 mV 1.8 % of reading + 2 mV 4.6 % of reading + 8.1 mV 4.6 % of reading + 9.2 mV 17 % of reading + 12 mV 0.024 % of reading + 4.6 mV 0.024 % of reading + 2.3 mV 0.024 % of reading + 2.3 mV 0.041 % of reading + 2.3 mV 0.14 % of reading + 2.3 mV 0.46 % of reading + 12 mV 1.7 % of reading + 12 mV 0.048 % of reading + 46 mV 0.048 % of reading + 23 mV 0.071 % of reading + 23 mV 0.19 % of reading + 23 mV 0.35 % of reading + 23 mV	Agilent 3458A 8.5 Digit Multimeter
AC High Voltage – Measure ¹	(1 to 10) kV (10 to 200) Hz (200 to 450) Hz (450 to 600) Hz (10 to 35) kV (30 to 200) Hz (200 to 450) Hz (450 to 600) Hz (35 to 70) kV (30 to 100) Hz (100 to 450) Hz (450 to 600) Hz (70 to 100) kV (30 to 100) Hz (100 to 450) Hz (450 to 600) Hz	0.14 % of reading + 0.17 V 0.46 % of reading + 0.17 V 0.86 % of reading + 0.17 V 0.11 % of reading + 0.81 V 0.7 % of reading + 0.81 V 1.5 % of reading + 0.81 V 0.14 % of reading + 1 V 0.7 % of reading + 1 V 3 % of reading + 1 V 0.2 % of reading + 1.3 V 1.2 % of reading + 1.3 V 17 % of reading + 1.3V	Vitrek 4700 High Voltage Meter with Associated Probes

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Current – Measure ¹	(0 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	33 μ A/A + 0.92 nA 29 μ A/A + 5.8 nA 29 μ A/A + 58 nA 46 μ A/A + 580 nA 0.013 % of reading + 12 μ A	Agilent 3458A 8.5 Digit Multimeter
DC Current – Measure ¹	(1 to 3) A (3 to 5) A (5 to 10) A	0.2 % of reading + 0.6 mA 0.12 % of reading + 1 mA 0.32 % of reading + 1.1 mA	Keysight 34465A 6.5 Digit Multimeter
DC Current – Source ¹	(0.22 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	41 μ A/A + 6 nA 36 μ A/A + 7 nA 36 μ A/A + 40 nA 48 μ A/A + 0.7 μ A 57 μ A/A + 12 μ A	Fluke 5720A Multiproduct Calibrator
DC Current – Source ¹	(2.2 to 11) A	0.4 mA/A + 0.48 mA	Fluke 5720A Multiproduct Calibrator, Fluke 5725A Amplifier
DC Current – Source ¹	(11 to 20) A	0.93 mA/A + 0.58 mA	Fluke 5522A Multiproduct Calibrator
DC Voltage – Measure ¹	(0 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	8.3 μ V/V + 0.58 μ V 5.3 μ V/V + 0.58 μ V 5.3 μ V/V + 0.58 μ V 7.7 μ V/V + 35 μ V 15 μ V/V + 0.12 mV 18 μ V/V + 0.12 mV 21 μ V/V + 0.12 mV	Agilent 3458A Opt. 002 8.5 Digit Multimeter
DC High Voltage – Measure ¹	(1 to 10) kV (10 to 45) kV (35 to 70) kV (70 to 100) kV	0.04 % of reading + 40 mV 0.064 % of reading + 66 mV 0.09 % of reading + 80 mV 0.17 % of reading + 0.92 V	Vitrek 4700 High Voltage Meter with Associated Probes
DC Voltage – Source ¹	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1 100) V	8.5 μ V/V + 0.4 μ V 5.1 μ V/V + 0.7 μ V 4 μ V/V + 2.5 μ V 3.9 μ V/V + 4 μ V 6.2 μ V/V + 40 μ V 7.6 μ V/V + 0.4 mV	Fluke 5720A Multiproduct Calibrator



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Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
DC Resistance – Measure ¹	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	18 μΩ/Ω + 58 μΩ 15 μΩ/Ω + 0.58 mΩ 13 μΩ/Ω + 0.58 mΩ 21 μΩ/Ω + 5.8 mΩ 13 μΩ/Ω + 58 mΩ 21 μΩ/Ω + 2.3 Ω 62 μΩ/Ω + 120 Ω 0.059 % of reading + 1.2 kΩ 0.82 % of reading + 12 kΩ	Agilent 3458A 8.5 Digit Multimeter
DC Resistance – Source ¹ (Fixed Simulation)	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ	40 μΩ/Ω 98 μΩ/Ω 96 μΩ/Ω 24 μΩ/Ω 25 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 9.4 μΩ/Ω 9.4 μΩ/Ω 9.4 μΩ/Ω	Fluke 5720A Multiproduct Calibrator
DC Resistance – Source ¹ (Fixed Simulation)	19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	9.4 μΩ/Ω 12 μΩ/Ω 12 μΩ/Ω 22 μΩ/Ω 23 μΩ/Ω 42 μΩ/Ω 49 μΩ/Ω 0.11 mΩ/Ω	Fluke 5720A Multiproduct Calibrator
DC Resistance – Source ¹ (Variable Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 111) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ	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	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
DC Resistance – Source ¹ (Variable Simulation)	(110 to 330) kΩ 330 kΩ to 1.19 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	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	Fluke 5522A Multiproduct Calibrator
DC Resistance – Source ¹ Up to 5 kV Voltage (Fixed Artifact)	1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ 1 TΩ	0.012 % of reading 0.012 % of reading 0.012 % of reading 0.012 % of reading + 1.2 μΩ/Ω/V 0.014 % of reading + 1.2 μΩ/Ω/V 0.021 % of reading + 1.2 μΩ/Ω/V 0.58 % of reading + 1.2 μΩ/Ω/V 0.62 % of reading + 2.3 μΩ/Ω/V 1.2 % of reading + 5.8 μΩ/Ω/V 2.3 % of reading + 12 μΩ/Ω/V	IET Labs VRS-100-10-1k-BP High Resistance Decade Box
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	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	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, 500 Ω		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		

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	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 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	Type R (0 to 250) °C	0.46 °C	Fluke 5522A Multiproduct Calibrator
	(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		
Capacitance – Source ¹ (Fixed Artifact)	1 kHz 10 pF	0.14 pF	General Radio 1403G Standard Air Capacitor
Capacitance – Source ¹ (Variable Artifact)	1 kHz 100 pF to 1 nF (1 to 2) nF (2 to 10) nF (10 to 100) nF 100 nF to 1.111 μF	0.18 % of reading + 0.58 pF 0.15 % of reading + 0.17 pF 0.12 % of reading + 0.17 pF 0.09 % of reading + 58 fF 0.08 % of reading + 58 fF	General Radio 1423A Decade Capacitance Box
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	0.4 % of reading + 7.8 pF 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	Fluke 5522A Multiproduct Calibrator

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment		
Capacitance – Source ¹ (Simulation)	(110 to 330) nF 10 Hz to 1 kHz	0.2 % of reading + 0.23 nF	Fluke 5522A Multiproduct Calibrator		
	(0.33 to 1.1) μF (10 to 600) Hz	0.21 % of reading + 0.78 nF			
	(1.1 to 3.3) μF (10 to 300) Hz	0.21 % of reading + 2.3 nF			
	(3.3 to 11) μF (10 to 150) Hz	0.2 % of reading + 7.8 nF			
	(11 to 33) μF (10 to 120) Hz	0.32 % of reading + 23 nF			
	(33 to 110) μF (10 to 80) Hz	0.37 % of reading + 78 nF			
	(110 to 330) μF DC to 50 Hz	0.38 % of reading + 0.23 μF			
	(0.33 to 1.1) mF DC to 20 Hz	0.35 % of reading + 0.78 μF			
	(1.1 to 3.3) mF DC to 6 Hz	0.35 % of reading + 2.3 μF			
	(3.3 to 11) mF DC to 2 Hz	0.35 % of reading + 7.8 μF			
	(11 to 33) mF DC to 0.6 Hz	0.58 % of reading + 23 μF			
	(33 to 110) mF DC to 0.2 Hz	0.85 % of reading + 78 μF			
	Oscilloscopes ^{1,3} Amplitude – DC into 50 Ω load into 1 MΩ load	(-6.6 to 6.6) V		0.22 % of reading + 31 μV	Fluke 5522A/SC1100 Multiproduct Calibrator
		(-130 to 130) V		0.12 % of reading + 31 μV	
Amplitude – Square Wave into 50 Ω load 10 Hz to 100 kHz 1 mVp-p to 6.6 Vp-p		0.22 % of reading + 31 μV			
into 1 MΩ load 10 Hz to 1 kHz 1 mVp-p to 130 Vp-p		0.14 % of reading + 31 μV			
(1 kHz to 10) kHz 1 mVp-p to 130 Vp-p		0.22 % of reading + 31 μV			

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ^{1,3} Time Markers into 50 Ω load	1 ns to 20 ms 50 ms 0.1 s 0.2 s 0.5 s 1 s 2 s 5 s	0.000 22 % of reading 0.005 9 % of reading 0.009 8 % of reading 0.018 % of reading 0.041 % of reading 0.08 % of reading 0.16 % of reading 0.39 % of reading	Fluke 5522A/SC1100 Multiproduct Calibrator
Rise Time 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	50 ps 50 ps	
Leveled Sine Wave into 50 Ω load	5 mVp-p to 5.5 Vp-p 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5.0 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 5.0 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	

Electrical – DC/Low Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Oscilloscopes ^{1,3} Input Impedance – Measure	(40 to 60) Ω 500 kΩ to 1.5 MΩ	0.082 % of reading 0.081 % of reading	Fluke 5522A/SC1100 Multiproduct Calibrator
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	0.001 9 % of reading + 12 mHz	

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Gauge Blocks ²	Up to 4 in (5 to 20) in	(1.2 + 1.5L) μin (1.7 + 0.9L) μin	Gauge Block Comparator, Master Gauge Blocks, Master Long Gauge Blocks
	Up to 100 mm (125 to 500) mm	(30 + 1.5L) nm (43 + 0.9L) nm	
Outside Micrometers ^{1,2}	Up to 6 in (6 to 60) in	(30 + 2L) μin (60 + 5L) μin	Gauge Blocks, Long Gauge Blocks
Inside Micrometers ¹	Up to 24 in (24 to 60) in	300 μin 400 μin	Height Master, Surface Plate
Depth Micrometers ^{1,2}	Up to 12 in	350 μin	Height Master, Surface Plate
Anvil Flatness ^{1,2}	Up to 1 inD	9.3 μin	Optical Flat
Anvil Parallelism ^{1,2}	Up to 1 inD	12 μin	Optical Parallel

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Calipers ¹ Outside Diameter	Up to 12 in (12 to 24) in (24 to 40) in	300 μin 430 μin 460 μin	Gauge Blocks
Inside Diameter, Depth, Step	Up to 12 in	300 μin	Gauge Blocks, Gauge Block Accessories, Surface Plate
Jaw Parallelism	Up to 1 in	7.2 μin	Cylindrical Pin Gauges
Bore Gauges ^{1,2}	Up to 8 in	(75 + 2L) μin	Characterized Cylindrical Rings
Digital/Dial Indicators, Test Indicators ¹ 0.001 in resolution 0.000 1 in resolution 0.000 01 in resolution	Up to 4 in Up to 1 in Up to 0.025 in	160 μin 24 μin 10 μin	SIP Measuring Machine
Electronic Linear Displacement Probes ²	Up to 100 mm	(0.031 + 0.003 1L) μm	Gauge Blocks
Height Gauges/Stands ^{1,2}	Up to 40 in	(240 + 1.2L) μin	Height Master, Surface Plate
Step Gauges, Micrometer Setting Standards ^{1,2}	Up to 60 in	(35 + 1.3L) μin	Comparison to Master Step Gauge using Linear Probe, Amplifier, Surface Plate
Height Master, Riser Blocks ^{1,2}	Up to 24 in	(35 + 1.3L) μin	Comparison to Gauge Blocks using Linear Probe, Amplifier, Surface Plate
Thread Wires	Up to 1 in	13 μin	SIP Measuring Machine
Cylindrical Plug Gauges ² Outside Diameter	Up to 12 in	(16 + 5L) μin	SIP Measuring Machine
Cylindrical Pin Gauges Outside Diameter	Up to 1 in	25 μin	Non-contact Measurement using Laser Micrometer
Cylindrical Ring Gauges ² Inside Diameter	Up to 12 in	(16 + 5L) μin	Sip Measuring Machine

Length – Dimensional Metrology

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Thread Plug Gauges, Thread Setting Plug Gauges ² Pitch Diameter – 60° Thread	Up to 1.5 in (1.5 to 6) in (6 to 12) in	100 μin 200 μin 300 μin	SIP Measuring Machine, Thread Wires
Major Diameter	Up to 12 in	(16 + 5L) μin	SIP Measuring Machine, Master Plug Gauge
Step Height	Up to 1 in	40 μin	Comparison to Height Master using Electronic Probe, Amplifier, Surface Plate
Solid Thread Ring Gauges Inner Pitch Diameter	Up to 1 in (1 to 4) in (4 to 7) in	79 μin 80 μin 83 μin	SIP Measuring Machine
Adjustable Thread Ring Gauges ³ Pitch Diameter – 60° Thread	Up to 1.5 in (1.5 to 6) in (6 to 12) in	See Footnote 3	Tactile Fit using Thread Setting Plug Gauge
Pipe Thread Plug Gauges Simple Pitch Diameter (4 to 80) TPI	Up to 1.5 in (1.5 to 6) in	100 μin 200 μin	SIP Measuring Machine, Master Plug Gauge, Thread Wires
Step Height	Up to 2 in	40 μin	Comparison to Height Master using Electronic Probe, Amplifier, Surface Plate
Pipe Thread Ring Gauges Standoff to Master	Up to 6 in	0.001 in	ASME 1.20.1, ASME B1.20.5
Thickness	N/A	100 μin	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Pipettes Single Channel	(0.2 to 2) μ l	17 nl	Gravimetric Method using Electronic Balances.
	(2 to 10) μ l	21 nl	
	(10 to 20) μ l	25 nl	
	(20 to 100) μ l	0.1 μ l	
	(100 to 200) μ l	0.14 μ l	
	(200 to 1 000) μ l	0.76 μ l	
	(1 to 5) ml	4.4 μ l	
	(5 to 10) ml	5.9 μ l	
	(10 to 50) ml	7.6 μ l	
	Multi-Channel	(2 to 20) μ l	
	(2 to 200) μ l	0.36 μ l	
	(200 to 1 000) μ l	0.76 μ l	
Torque Wrenches, Torque Screwdrivers ¹	10 ozf·in to 1 000 lbf·ft	1.2 % of reading	Torque Calibration System
Pneumatic Pressure Devices	(-1.32 to 1.32) psig	0.000 15 psi	Fluke PPC4 Pressure Controller/Calibrator, Fluke Reference Pressure Transducers
	(-2.2 to 2.2) psig	0.01 % of reading	
	Up to 9 psig	0.000 73 psi	
	(9 to 30) psig	0.008 2 % of reading	
	Up to 300 psig	0.031 psi	
	(300 to 1 000) psig	0.01 % of reading	
Absolute Pneumatic Pressure Devices	(-14.7 to 300) psia	0.031 psi	Fluke PPC4 Pressure Controller/Calibrator with Absolute Pressure Transducer, Built-in Barometric Pressure Reference Gauge
	(300 to 1 000) psia	0.01 % of reading	
Hydraulic Pressure Devices	Up to 600 psig	0.12 psi	Fluke RPM4-E-DWT Electronic Deadweight Tester
	(600 to 3 000) psig	0.6 psi	
	(3 000 to 30 000) psig	0.02 % of reading	
Mass Determination (SI)	(1 to 200) mg	2 μ g	Modified Double Substitution using ASTM E617 Class 1 Weight Set and Electronic Balances.
	300 mg	3 μ g	
	500 mg	4 μ g	
	1 g	7 μ g	
	2 g	7 μ g	
	3 g	8 μ g	
	5 g	10 μ g	
	10 g	17 μ g	

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Mass Determination (SI)	20 g	33 µg	Modified Double Substitution using ASTM E617 Class 1 Weight Set and Electronic Balances.
	30 g	50 µg	
	50 g	40 µg	
	100 g	80 µg	
	200 g	0.1 mg	
	300 g	0.15 mg	
	500 g	0.15 mg	
	1 kg	0.5 mg	
	2 kg	2 mg	
	3 kg	2.4 mg	
	5 kg	2.5 mg	
	10 kg	10 mg	
	20 kg	20mg	
	25 kg	30 mg	
Mass Determination (SI)	10 kg	40 mg	Single Substitution using ASTM E617 Class 1 Weight Set and Electronic Balances.
	20 kg	60 mg	
	25 kg	70 mg	
Scales and Balances ^{1,4} (Non-automatic)	1 mg	3 µg	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.
	2 mg	3 µg	
	5 mg	3 µg	
	10 mg	3 µg	
	20 mg	3 µg	
	50 mg	3 µg	
	100 mg	3 µg	
	200 mg	3 µg	
	500 mg	5 µg	
	1 g	7 µg	
	2 g	7 µg	
	5 g	10 µg	
	10 g	19 µg	
	(10 to 20) g	35 µg	
	(20 to 50) g	0.1 mg	
	(50 to 100) g	0.1 mg	
	(100 to 200) g	0.15 mg	
	(200 to 300) g	0.25 mg	
	(300 to 500) g	0.35 mg	
	(0,5 to 1.2) kg	2 mg	
(1.2 to 8) kg	40 mg		
(8 to 30) kg	80 mg		

Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Scales and Balances ^{1,4} (Non-automatic)	(30 to 60) kg (60 to 150) kg (150 to 500) kg (500 to 1000) kg	30 mg 3 g 30 g 60 g	ASTM E617 Class 1 weights and internal calibration procedure utilized for the calibration of the weighing system.

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Infrared Thermometers ¹	(-15 to 0) °C (0 to 50) °C (50 to 100) °C (100 to 120) °C (120 to 200) °C (200 to 350) °C (350 to 500) °C	0.8 °C 0.65 °C 0.7 °C 0.76 °C 0.94 °C 1.6 °C 2.1 °C	Fluke 4180, 4181 Blackbody Sources (Flat Plate) $\lambda = (8 \text{ to } 14) \mu\text{m}$, $\epsilon = (0.9 \text{ to } 1)$
Liquid Baths, Dry-wells	(-200 to 630) °C	0.1 °C	SPRT, Black Stack Thermometer
Digital Thermometers with RTD, PRT, and Thermistor Probes	(-30 to 50) °C (50 to 150) °C (150 to 450) °C (450 to 650) °C	0.15 °C 0.17 °C 0.5 °C 0.65 °C	Comparison to SPRT with Black Stack Thermometer, Dry-well
Digital Thermometers with Thermocouple Probes	(-30 to 50) °C (50 to 155) °C (155 to 660) °C	0.3 °C 0.4 °C 0.066 % of reading + 0.67 °C	Comparison to SPRT with Black Stack Thermometer, Dry-well
Humidity – Measure ¹	(-10 to 70) °C (10 to 90) %RH (90 to 95) %RH	3.1 %RH 4 %RH	Vaisala HMI41/HMP45 Temp/Humidity Indicator/Probe
Temperature/Humidity Measuring Devices Temperature – Generate	(-10 to 70) °C	0.1 °C	Thunder Scientific 2500 Two-Pressure Humidity Generator
Humidity – Generate	(-10 to 15) °C (10 to 75) %RH (75 to 95) %RH	0.5 %RH 0.65 %RH	

Thermodynamic

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Temperature/Humidity Measuring Devices Humidity – Generate	(15 to 35) °C (10 to 95) %RH (35 to 70) °C (10 to 50) %RH (50 to 75) %RH (75 to 95) %RH	0.5 %RH 0.5 %RH 0.7 %RH 0.85 %RH	Thunder Scientific 2500 Two-Pressure Humidity Generator

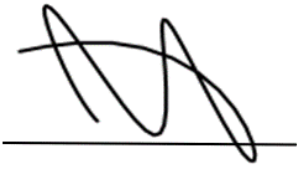
Time and Frequency

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Contact Tachometers ²	(55 to 350) rpm (351 to 1 499) rpm (1 500 to 3 000) rpm (3 001 to 5 000) rpm (5 001 to 10 000) rpm (10 001 to 15 000) rpm (15 001 to 40 000) rpm	0.12 rpm 0.11 rpm 0.29 rpm 0.37 rpm 0.78 rpm 1.8 rpm 3.3 rpm	Contact Tachometer Calibration System
Non-contact Tachometer ^{1,2}	(6 to 60) rpm (60 to 600) rpm (600 to 99 999) rpm	0.005 3 % of reading 0.000 75 % of reading 0.000 3 % of reading	Signal Generator, LED
Frequency – Measure ¹	(1 to 10) Hz 10 Hz to 1 kHz 1 kHz to 1.3 GHz	11 μHz 90 nHz/Hz + 10 μHz 0.1 μHz/Hz	Fluke PM6681 Timer/Counter/Analyzer
Period – Measure ¹	(1 to 9) s	9.8 μs/s + 1.2 μs	Fluke PM6681 Timer/Counter/Analyzer

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 or mm; D = diameter in inches; rpm = revolutions per minute.
3. The “tactile fit” setting of an adjustable thread ring with a thread setting plug is not a measurement of pitch diameter. The uncertainty for this pitch diameter setting is based on the contributors associated with the thread setting plug and environmental conditions only.
4. 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.
5. This scope is formatted as part of a single document including Certificate of Accreditation No. AC-2489.28.



Jason Stine, Vice President

