



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid until: August 31, 2018

Certificate Number: 3332.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Gage Block Length – Steel, Rectangular & Square	Up to 4 in (4 to 20) in	(2.8 + 1.6L) μin (2.5 + 2.9L) μin	Comparison method w/ a reference gage block set
	Up to 100 mm (100 to 500) mm	(0.061 + 0.002L) μm (0.080 + 0.0021L) μm	ANSI /ASME B89.1.2M, FED SPEC GGG-G-15C
Cylindrical Ring Gage – Diameter	Up to 8 in Up to 200 mm	(20 + 6D) μin (0.5 + 0.006D) μm	Comparison method w/ ring gages and Mahr Model 828. ANSI /ASME B89.1.6M
Cylindrical Plug Gage – Diameter	Up to 8 in Up to 200 mm	(12 + 6D) μin (0.31 + 0.006D) μm	ANSI /ASME B89.1.5

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Thread Plug Gage (60°) & Thread Setting Plug Gage –			
Pitch Diameter	Up to 1 in (>1 to 6) in Up to 80 TPI	85 μin (85 + 6D) μin	ANSI /ASME B1.2, ANSI /ASME B1.16M
Major Diameter	Up to 25 mm (>25 to 150) mm Up to 5.0 mm pitch	2.2 μm (2.2 + 0.006D) μm	Diameter on flank, measured with thread wires
	Up to 8 in Up to 200 mm	(12 + 6D) μin (0.31 + 0.006D) μm	
Thread Ring Gauge – (60°) Adjustable (Set to Thread Setting Plug, Pitch Diameter only)	Up to 1 in (>1 to 3) in	85 μin (85 + 6D) μin	ANSI /ASME B1.2
	Up to 25 mm (>25 to 75) mm	2.2 μm (2.2 + 0.006D) μm	ANSI /ASME B1.16M
Thread Measuring Wires	Up to 1 in	13 μin	ANSI /ASME B1.2,
	Up to 25 mm	0.34 μm	ANSI /ASME B1.16M
Analog Indicators	0.001 in Graduations 0.0001 in Graduations 0.00002 in Graduations 0.00005 in Graduations	560 μin 72 μin 20 μin 41 μin	Using height master
	0.02 mm Graduations 0.002 mm Graduations 0.0002 mm Graduations	13 μm 1.4 μm 0.4 μm	Comparison with gage blocks. ANSI /ASME B89.1.10M
Digital Indicators	0.0005 in Resolution 0.0001 in Resolution 0.00005 in Resolution	580 μin 130 μin 53 μin	Using height master
	0.01 mm Resolution 0.001 mm Resolution	12 μm 1.2 μm	Comparison with gage blocks. ANSI /ASME B89.1.10M

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Micrometers – Outside	Up to 6 in (6 to 40) in	(41 + 1.8L) μin (25 + 5.2L) μin	CAN/CGSB-39-18, comparison with gage blocks
	Up to 150 mm (150 to 2000) mm	(1.1 + 0.0018L) μm (0.63 + 0.0052L) μm	
Micrometer – Inside	Up to 24 in (24 to 60) in	(100 + 7.4L) μin (100 + 8.5L) μin	CAN/CGSB-39-18, comparison with gage blocks
	Up to 600 mm (600 to 1500) mm	(2.6 + 0.007L) μm (2.6 + 0.008L) μm	
Micrometer – Depth	Up to 12 in	(120 + 12L) μin	CAN/CGSB-39-18, comparison with gage blocks
	Up to 300 mm	(2.9 + 0.012L) μm	
Micrometer – Three Point Internal	Up to 4 in	(81 + 3L) μin	Comparison with ring gages
	Up to 100 mm	(2.1 + 0.003L) μm	
Micrometer – Setting Standards	Up to 60 in	(26 + 9L) μin	Comparison with gage blocks
	Up to 1500 mm	(0.67 + 0.009L) μm	
Caliper – Outside	Up to 40 in	(300 + 2L) μin	CAN/CGSB-39-19, comparison with gage blocks
	Up to 1000 mm	(7.6 + 0.002L) μm	
Caliper – Inside	Up to 12 in	330 μin	Comparison with gage blocks
	Up to 300 mm	8.2 μm	
Caliper – Depth	Up to 12 in	330 μin	Comparison with gage blocks
	Up to 300 mm	8.2 μm	
Height Gauges	Up to 40 in	(100 + 3.5L) μin	FED SPEC GGG-G- 111C with comparison with gage blocks
	Up to 1000 mm	(2.6 + 0.0035L) μm	

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
DC Voltage ³ – Generate	(0 to 329.9999) mV (0.33 to 3.299999) V (3.3 to 32.9999) V (33 to 329.9999) V (100 to 1000) V	0.0011 % + 2.9 μV 0.0006 % + 19 μV 0.0006 % + 0.17 mV 0.0011 % + 1.6 mV 0.0005 % + 21 mV	Fluke 5520A
DC Voltage – Measure	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	10 μV/V + 0.18 μV 6.2 μV/V + 3.2 μV 6.2 μV/V + 29 μV 0.001 % + 0.36 mV 0.001 % + 3.1 mV	HP 3458A
DC High Voltage ³ – Measure	(1 to 50) kV (50 to 100) kV	0.23 V/kV + 1.9 V 4.4 V/kV + 9.3 V	Precision high voltage meter and probe Voltage divider and meter
DC Current ³ – Generate	(0 to 329.999) μA (0.33 to 3.29999) mA (3.3 to 32.9999) mA (33 to 329.999) mA (0 to 1.09999) A (1.1 to 2.99999) A (0 to 10.9999) A (11 to 20.5) A	2.1 μA/A + 2.1 μA 0.70 μA/A + 22 μA 0.62 μA/A + 0.22 μA 0.58 μA/A + 2.2 μA 140 μA/A + 0.1 mA 0.027 % + 0.13 mA 0.0053 % + 20 mA 0.017 % + 61 mA	Fluke 5520A
Clamp Meters – Non-Toroidal	(10 to 150) A (150 to 500) A (500 to 1025) A	1.2 % 0.9 % 0.7 %	Fluke 5520A & coil

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
DC Current – Measure	(0 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 20) A 10 µA to 200 mA	24 µA/A + 0.03 nA 16 µA/A + 0.03 nA 16 µA/A + 0.08 nA 17 µA/A + 0.001 µA 16 µA/A + 0.012 µA 16 µA/A + 0.11 µA 27 µA/A + 0.39 µA 130 µA/A + 17 µA 420 µA/A + 220 µA 0.30 %	HP 3458A Fluke 8508A Hipot leakage current using a digital meter
Electrical Simulation of Temperature Indicators RTD simulation ³	(-200 to 660) °C	0.0065 % + 0.04 °C	Fluke 5520A
AC Power ³ – (0.2 to 20.5) A (45 to 65) Hz	(0.033 to 1020) V	0.08 %	Fluke 5520A
DC Power ³ – (0.2 to 20.5) A	(1 to 1020) V	0.035 %	Fluke 5520A
Electrical Simulation of Temperature Indicators Thermocouple Simulation ³ – Type J Type K Type T Type N Type S Type B Type E	(-210 to 1200) °C (-200 to 1372) °C (-250 to 400) °C (-200 to 1300) °C (0 to 1767) °C (600 to 1820) °C (-250 to 1000) °C	0.010 % + 0.19 °C 0.006 % + 0.15 °C 0.055 % + 0.28 °C 0.006 % + 0.24 °C 0.004 % + 0.37 °C 0.006 % + 0.31 °C 0.017 % + 0.23 °C	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
AC Voltage – Generate (0.0032 to 32.99) mV (33 mV to 329.99) mV (0.33 to 3.299999) V (3.3 to 32.9999) V (33 to 329.9999) V (100 to 1020) V	45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz	0.013 % + 5 µV 0.010 % + 14 µV 0.009 % + 210 µV 0.010 % + 1.8 mV 0.012 % + 16 mV 0.015 % + 170 mV	Fluke 5520A
AC Voltage – Measure 1 µV to 0.01 V (0.01 to 0.1) V (0.1 to 1.0) V (1.0 to 10.0) V (10.0 to 100.0) V (100.0 to 1000) V	40 Hz to 20 kHz 40 Hz to 20 kHz 40 Hz to 20 kHz 40 Hz to 20 kHz 40 Hz to 20 kHz 40 Hz to 20 kHz	0.08 % + 1.5 µV 0.005 % + 8.2 µV 0.008 % + 20 µV 0.005 % + 0.2 mV 0.02 % + 5.8 mV 0.02 % + 51 mV	HP 3458A
AC High Voltage – Measure³ (1 to 100) kV	60 Hz	4.7 V/kV + 0.1 V	Voltage divider and meter
AC Current³ – Generate (29 to 329.99) µA (0.33 to 3.299) mA (3.3 to 32.99) mA (33 to 329.99) mA (0.33 to 1.09999) A (1.1 to 2.99999) A (3 to 10.9999) A (11 to 20.5) A	45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz 45 Hz to 1 kHz (45 to 100) Hz (45 to 100) Hz	0.07 % + 0.24 µA 0.08 % + 0.69 µA 0.03 % + 3.3 µA 0.03 % + 26 µA 0.05 % + 0.24 mA 0.06 % + 0.45 mA 0.02 % + 21 mA 0.05 % + 33 mA	Fluke 5520A
AC Current³ – Measure 100 pA to 100 µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 20) A 10 µA to 200 mA	45 Hz to 1 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz 45 Hz to 5 kHz 55 Hz to 5 kHz 60 Hz	0.05 % + 0.033 µA 0.05 % + 0.25 µA 0.05 % + 2.4 µA 0.05 % + 25 µA 0.06 % + 260 µA 0.016 % + 800 µA 0.36 %	HP 3458A Fluke 8508A Hipot leakage current using a digital meter

Parameter/Range	Frequency	CMC ^{2, 6} (±)	Comments
Clamp Meters – Toroidal			
(10 to 150) A	(45 to 65) Hz	0.6 %	Fluke 5520A & coil
(150 to 500) A	(45 to 65) Hz	0.4 %	
(500 to 1025) A	(45 to 65) Hz	0.3 %	
Clamp Meters – Other Than Toroidal			
(40 to 150) A	(45 to 65) Hz	1.4 %	Fluke 5520A & coil
(150 to 500) A	(45 to 65) Hz	1.3 %	
(500 to 1025) A	(45 to 65) Hz	0.8 %	

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Resistance ³ –			
Generate	(0 to 10.9999) Ω	0.0017 % + 0.78 mΩ	Fluke 5520A
	(11 to 32.999) Ω	0.0032 % + 1.1 mΩ	
	(33 to 109.9999) Ω	0.0018 % + 2.0 mΩ	
	(110 to 329.9999) Ω	0.0023 % + 2.1 mΩ	
	330 Ω to 1.099999 kΩ	0.0080 % + 18 mΩ	
	(1.1 to 3.29999) kΩ	0.0018 % + 77 mΩ	
	(3.3 to 10.99999) kΩ	0.0017 % + 180 mΩ	
	(11 to 32.99999) kΩ	0.0023 % + 540 mΩ	
	(33 to 109.9999) kΩ	0.0018 % + 1.7 Ω	
	(110 to 329.9999) kΩ	0.0025 % + 5.1 Ω	
	330 kΩ to 1.099999 MΩ	0.0025 % + 13 Ω	
	(1.1 to 3.299999) MΩ	0.0046 % + 90 Ω	
	(3.3 to 10.99999) MΩ	0.012 % + 380 Ω	
	(11 to 32.99999) MΩ	0.019 % + 4.7 kΩ	
	(33 to 109.9999) MΩ	0.033 % + 24 kΩ	
	(110 to 329.9999) MΩ	0.23 % + 0.41 MΩ	
	(330 to 1100) MΩ	2.0 % + 0.4 MΩ	
Fixed Points	10 μΩ	0.27 %	Standard resistors
	100 μΩ	0.027 %	
	1 mΩ	0.017 %	
	10 mΩ	0.015 %	
	100 mΩ	0.014 %	
	1 Ω	0.013 %	
	10 Ω	0.013 %	

Parameter/Range	Frequency	CMC ^{2,4,6} (±)	Comments
Resistance ³ – Measure	100 μΩ 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 (10 to 100) μΩ (0.1 to 1) mΩ (1 to 10) mΩ (10 to 100) mΩ 100 mΩ to 1 Ω (1 to 10) Ω	0.001 % + 0.04 mΩ 0.001 % + 0.54 mΩ 0.001 % + 3.2 mΩ 0.001 % + 0.03 mΩ 0.001 % + 0.3 mΩ 0.0017 % + 7.2 Ω 0.004 % + 250 Ω 0.04 % + 6.7 kΩ 0.013 % 0.013 % 0.013 % 0.004 % 0.003 % 0.002 %	HP 3458A Standard resistors and transfer method
Capacitance ³	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	0.43 % + 0.008 nF 0.38 % + 0.008 nF 0.44 % + 0.007 nF 0.11 % + 0.017 nF 0.22 % + 0.075 nF 0.20 % + 0.08 nF 0.19 % + 0.25 nF 0.20 % + 0.3 nF 0.20 % + 2.4 nF 0.20 % + 8.2 nF 0.38 % + 6.4 nF 0.37 % + 74 nF 0.35 % + 0.24 μF 0.35 % + 0.78 μF 0.35 % + 2.3 μF 0.41 % + 1.3 μF 0.69 % + 11 μF 0.82 % + 140 μF	Fluke 5520A

III. Mechanical

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Torque Wrenches & Screwdrivers: Clockwise	0.5 in·ozf to 1000 in·lbf (10 to 250) ft·lbf (250 to 2000) ft·lbf	0.55 % 0.55 % 0.55 %	Electronic transducer system
Indirect Verification of Rockwell Hardness Testers ³	HRBW: < 60 HRBW (≥ 60 to 79) HRBW ≥ 80 HRBW HRC: < 35 HRC (≥ 35 to < 60) HRC ≥ 60 HRC	1.1 HRBW 0.67 HRBW 0.49 HRBW 0.41 HRC 0.37 HRC 0.35 HRC	Indirect verification per ASTM E18
Scales and Balances ³ – Fixed Points	(1 to 500) mg 1 g 2 g 3 g 5 g 10 g 20 g 30 g 50 g 100 g 200 g 300 g 500 g 1 kg 2 kg 5 kg 10 kg	0.012 mg 0.05 mg 0.04 mg 0.04 mg 0.04 mg 0.04 mg 0.059 mg 0.086 mg 0.087 mg 0.14 mg 0.29 mg 0.59 mg 0.87 mg 1.4 mg 3.0 mg 5.9 mg 14 mg 29 mg	ASTM Class 1 weights

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Pressure Indicators and Gauges –			
Pneumatic Pressure	(0 to 5) psi	0.013 % + 0.002 psi	Pressure calibrator
Hydraulic Pressure	(10 to 800) psi	0.045 %	Deadweight tester
Hydraulic Pressure	(800 to 16 000) psi	0.045 %	Deadweight tester
Barometric Pressure	(70 to 110) kPa	0.010 %	Pressure calibrator
Vacuum	(0 to -14.5) psig (0 to -29.5) inHg	0.010 % + 0.002 psi 0.010 % + 0.004 inHg	Pressure calibrator

IV. Thermodynamics

Parameter/Range	Range	CMC ^{2,4} (±)	Comments
Relative Humidity ³ – Measuring Equipment	(10 to 90) % RH	1.0 %	Humidity generator
Temperature –			
Liquid in Glass Thermometers	(-80°C to 250) °C	0.039 °C	Liquid calibration baths w/ SPRT
Digital thermometer: Thermocouples /Thermocouples ³	(-40 to 50) °C (50 to 300) °C (300 to 700) °C (700 to 1200) °C	0.44 °C 0.56 °C 0.90 °C 4.7 °C	Metrology wells (dry) Thermocouple furnace
Digital Thermometer: Resistance	(-80 to 50) °C (50 to 250) °C	0.025 °C 0.038 °C	Liquid calibration baths w/ SPRT
Infrared Thermometer	(35 to 100) °C (100 to 350) °C (350 to 500) °C	0.6 °C 0.29 % + 0.8 °C 0.29 % + 1.5 °C	Infrared calibrator
Air Probe Thermometer	(10 to 45) °C	0.24 °C	Environmental chamber & SPRT

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 6} (±)	Comments
Frequency – Measure	(1 to 40) Hz 40 Hz to 10 MHz	0.04 % + 1 µHz 0.01 % + 0.012 Hz	HP 3458A
Frequency – Measuring Equipment	0.01 Hz to 2 MHz	2.5 µHz/Hz + 5 µHz	Fluke 5520A
Timers ³	60 s to 1 h	1.2 s	Reference stopwatch
Stopwatches	20 s to 24 h	37 ms	NIST Publication 960-12
Optical Tachometers ³	(90 to 90 000) rpm	0.0042 % + 0.0078 rpm	Fluke 5520A

¹ This laboratory offers commercial calibration service and field calibration service.

² Calibration and Measurement Capability uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMC's represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ In the statement of CMC, the value is defined as the percentage of reading, unless otherwise noted

⁵ In the statement of CMC, L is the numerical value of the nominal length of the gage block in inches or millimeters as noted, and D is the numerical value of the nominal diameter of the gage in inches or millimeters as noted.

⁶ The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC's are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.



Accredited Laboratory

A2LA has accredited

TRESCAL, INC.

Montreal-Nord, Québec H1H 1T6, CANADA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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 8 January 2009).



Presented this 11th day of July 2016.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 3332.01
Valid to August 31, 2018

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.