



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

TRESCAL, INC.
4407 Charleroi Street
Montreal, Quebec, H1H 1T6 Canada
Christian Lefroit Phone: 514 329 3242 x 229

CALIBRATION

Valid until: August 31, 2020

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} (\pm)	Comments
Gage Block Length – Steel, Rectangular & Square	Up to 4 in (4 to 20) in	$(2.8 + 1.6L) \mu\text{in}$ $(2.5 + 2.9L) \mu\text{in}$	Comparison method w/ a reference gage block set
	Up to 100 mm (100 to 500) mm	$(0.061 + 0.002L) \mu\text{m}$ $(0.065 + 0.0022L) \mu\text{m}$	ANSI /ASME B89.1.2M, FED SPEC GGG-G-15C
Cylindrical Ring Gage – Diameter	Up to 8 in Up to 200 mm	$(20 + 6D) \mu\text{in}$ $(0.5 + 0.006D) \mu\text{m}$	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	$(12 + 6D) \mu\text{in}$ $(0.31 + 0.006D) \mu\text{m}$	ANSI /ASME B89.1.5

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Thread Plug Gage (60°) and 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
	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
Major Diameter	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 Up to 25 mm (>25 to 75) mm	85 μin (85 + 6D) μin 2.2 μm (2.2 + 0.006D) μm	ANSI /ASME B1.2 ANSI /ASME B1.16M
Indicators –			
Analog	0.001 in Graduation 0.0001 in Graduation 0.00002 in Graduation 0.00005 in Graduation	560 μin 72 μin 20 μin 41 μin	ANSI /ASME B89.1.10M height master, gage blocks
	0.02 mm Graduations 0.002 mm Graduations 0.0002 mm Graduations	13 μm 1.4 μm 0.4 μm	
Digital	0.0005 in Resolution 0.0001 in Resolution 0.00005 in Resolution	580 μin 130 μin 53 μin	
	0.01 mm Resolution 0.001 mm Resolution	12 μm 1.2 μm	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Micrometers ³ –			ASME B89.1.13
Outside	Up to 6 in (6 to 40) in	(41 + 1.8L) μin (25 + 5.2L) μin	Gage blocks
Inside	Up to 150 mm (150 to 2000) mm	(1.1 + 0.0018L) μm (0.63 + 0.0052L) μm	
Depth	Up to 24 in (24 to 60) in	(100 + 7.4L) μin (100 + 8.5L) μin	
	Up to 600 mm (600 to 1500) mm	(2.6 + 0.007L) μm (2.6 + 0.008L) μm	
	Up to 12 in	(120 + 12L) μin	
	Up to 300 mm	(2.9 + 0.012L) μm	
Bore Gauges	Up to 4 in Up to 100 mm	(81 + 3L) μin (2.1 + 0.003L) μm	Ring gages, UMM
Length Standards –			
Master Height Gauges, Setting rods, Step Gauges	Up to 60 in Up to 1500 mm	(26 + 9L) μin (0.67 + 0.009L) μm	Gage blocks
Caliper ³	Up to 40 in Up to 1000 mm	(300 + 2L) μin (7.6 + 0.002L) μm	Gage blocks
Height Gauges	Up to 40 in Up to 1000 mm	(100 + 3.5L) μin (2.6 + 0.0035L) μm	Gage blocks

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
High Voltage ³ –	(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 and 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 High Voltage ³ (1 to 100) kV	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 60 Hz	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 4.7 V/kV + 0.1 V	HP 3458A Voltage divider and meter
AC Current ³ – 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 Current ³ – 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 %	HP3458A Fluke 8508A Hipot leakage current using a digital meter

Parameter/Range	Frequency	CMC ^{2,6} (±)	Comments
Clamp Ammeters ³			
Toroidal (10 to 150) A (150 to 500) A (500 to 1025) A	(45 to 65) Hz (45 to 65) Hz (45 to 65) Hz	0.6 % 0.4 % 0.3 %	Fluke 5520A and coil
Other Than Toroidal (40 to 150) A (150 to 500) A (500 to 1025) A	(45 to 65) Hz (45 to 65) Hz (45 to 65) Hz	1.4 % 1.3 % 0.8 %	Fluke 5520A and coil
Resistance ³ – Generate	(0 to 10.9999) Ω (11 to 32.999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω 330 Ω to 1.099999 kΩ (1.1 to 3.29999) kΩ (3.3 to 10.99999) kΩ (11 to 32.99999) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ 330 kΩ to 1.099999 MΩ (1.1 to 3.299999) MΩ (3.3 to 10.99999) MΩ (11 to 32.99999) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	0.0017 % + 0.78 mΩ 0.0032 % + 1.1 mΩ 0.0018 % + 2.0 mΩ 0.0023 % + 2.1 mΩ 0.0080 % + 18 mΩ 0.0018 % + 77 mΩ 0.0017 % + 180 mΩ 0.0023 % + 540 mΩ 0.0018 % + 1.7 Ω 0.0025 % + 5.1 Ω 0.0025 % + 13 Ω 0.0046 % + 90 Ω 0.012 % + 380 Ω 0.019 % + 4.7 kΩ 0.033 % + 24 kΩ 0.23 % + 0.41 MΩ 2.0 % + 0.4 MΩ	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Resistance ³ – Generate Fixed Points	10 μΩ 100 μΩ 1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ	0.27 % 0.027 % 0.017 % 0.015 % 0.014 % 0.013 % 0.013 % 0.58 % 0.58 % 0.58 % 0.59 % 0.63 % 0.59 % 0.25 %	Standard resistors Fixed resistors: for the calibration of insulation testers
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



Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
Capacitance ³ –			Fluke 5520A
(0.19 to 0.3999) nF	10 Hz to 10 kHz	0.43 % + 0.008 nF	
(0.4 to 1.099) nF	10 Hz to 10 kHz	0.38 % + 0.008 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.44 % + 0.007 nF	
(3.3 to 10.9999) nF	10 Hz to 1 kHz	0.11 % + 0.017 nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.22 % + 0.075 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.20 % + 0.08 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.19 % + 0.25 nF	
0.33 μF to 1.09999 μF	(10 to 600) Hz	0.20 % + 0.3 nF	
(1.1 to 3.29999) μF	(10 to 300) Hz	0.20 % + 2.4 nF	
(3.3 to 10.9999) μF	(10 to 150) Hz	0.20 % + 8.2 nF	
(11 to 32.9999) μF	(10 to 120) Hz	0.38 % + 6.4 nF	
(33 to 109.999) μF	(10 to 80) Hz	0.37 % + 74 nF	
(110 to 329.999) μF	(0 to 50) Hz	0.35 % + 0.24 μF	
0.33 μF to 1.09999 mF	(0 to 20) Hz	0.35 % + 0.78 μF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.35 % + 2.3 μF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.41 % + 1.3 μF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.69 % + 11 μF	
(33 to 110) mF	(0 to 0.2) Hz	0.82 % + 140 μF	

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
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

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
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
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 - Negative pressure	(70 to 110) kPa (0 to -14.5) psig (0 to -29.5) inHg	0.010 % 0.010 % + 0.002 psi 0.010 % + 0.004 inHg	Pressure calibrator

IV. Optical Quantities

Parameter/Range	Range	CMC ^{2,4} (±)	Comments
Illuminance – Generate (Light Meters) Visible Spectrum	172 lux 16 ft/candles	1.6 % 1.6 %	Reference incandescent light source @ 2856K
	690 lux 64 ft/candles	2.1 % 2.1 %	
	1685 lux 157 ft/candles	2.6 % 2.6 %	
	4315 lux 401 ft/candles	3.8 % 3.8 %	
	7670 lux 713 ft/candles	4.5 % 4.5 %	

V. Thermodynamics

Parameter/Range	Range	CMC ^{2,4} (±)	Comments
Relative Humidity ³ – Measuring Equipment	(10 to 90) % RH	1.0 %	Humidity generator
Temperature Measure – Generate			
Liquid in Glass Thermometers	(-80°C to 250) °C	0.039 °C	Liquid calibration baths w/ SPRT
Digital thermometers: 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

Parameter/Range	Range	CMC ^{2,4} (±)	Comments
Temperature Measure – Generate (cont)			
Digital Thermometers: Resistance Thermometer	(-80 to 50) °C (50 to 250) °C	0.025 °C 0.038 °C	Liquid calibration baths w/ SPRT
Air Probe Thermometers	(10 to 45) °C	0.24 °C	Environmental chamber & SPRT
Infrared Thermometers	(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

VI. 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, 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 April 2017*).



Presented this 23rd day of August 2018.

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, 2020

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