



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: September 30, 2024

Certificate Number: 2747.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 6}:

I. Acoustical Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Sound Level Meter	94 db @ 1 kHz 114 db @ 1 kHz	0.11 db 0.11 db	Sound calibrator IEC 942 Class 2, ANSI S1.40

II. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Coordinate Measuring Machine (CMM) ³ Length Measurement Error (E _L) Volumetric & Linear	 Up to 300 mm Up to 500 mm Up to 600 mm Up to 1200 mm	 1.3 µm 1.3 µm 1.8 µm 2.2 µm	ISO 10360-2 Step gage and step gage fixture

Parameter/Equipment	Range	CMC ² (±)	Comments
Calipers ³ – Vernier, Dial, & Digital	Up to 150 mm Up to 200 mm Up to 300 mm Up to 450 mm Up to 600 mm	5.8 µm 5.8 µm 7.3 µm 7.4 µm 8.1 µm	Step gage
Optical Comparators, Measuring Microscopes & Vision Systems ³ – X & Y Axis Displacement	Up to 300 mm	4.2 µm	JIS B 7184 table 1 Section 8 Glass scale
Length Indicators ³ – Dial, Analog & Digital: Resolution 0.01 mm Resolution 0.001 mm Test Indicators: Resolution (0.002 to 0.01) mm	Up to 25 mm Up to 25 mm Up to 1 mm	5.8 µm 0.7 µm 0.6 µm	Gage blocks
Height Gage ³	Up to 600 mm	7.6 µm	Check master, step gage, surface plate
Surface Texture Roughness ³ – Ra Rz Rsm	2.92 µm 9.28 µm 99.88 µm	0.06 µm 0.21 µm 0.81 µm	ISO 4287 Roughness specimen
Granite Surface Plate ³ – Local Flatness Only at 4”	Up to 2500 mm x 1600 mm	1.1 µm	JIS B7513, electronic indicator, repeat reading gage
Pin Gages ³	Up to 25 mm	0.11 µm	Mitutoyo MDH-25M

Parameter/Equipment	Range	CMC ² (±)	Comments
Micrometers ³	25 mm 50 mm 75 mm 100 mm	0.58 µm 0.58 µm 0.58 µm 0.62 µm	Gage blocks
Coating Thickness Gage	0.024 mm 0.052 mm 0.078 mm 0.128 mm 0.255 mm 0.504 mm 1.025 mm 1.527 mm	0.7 µm 1.1 µm 1.1 µm 1.1 µm 1.5 µm 1.5 µm 1.7 µm 1.9 µm	Defelsko calibration standards and (certified plastic shims)

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
DC Voltage ³ – Generate	(0 to 300.00) mV (0 to 3.00) V (0 to 30.00) V (30 to 300.00) V (100 to 1000.00) V	0.012 mV 0.089 mV 0.89 mV 0.0098 V 0.032 V	Fluke 5500A/SC300
DC Voltage ³ – Measure	(0 to 200.00) mV (0 to 2.00) V (0 to 20.00) V (0 to 200.00) V (0 to 1000.00) V (0 to 6000) V	0.0086 µV 0.062 µV 0.60 mV 6.6 mV 31.0 mV 0.78V	HP 34401A Fluke 87V & 80k-6 HV probe
DC Current ³ – Measure	(0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A	0.21 µA 1.5 µA 0.013 mA 0.47 mA	HP 34401A

Parameter/Equipment	Range	CMC ^{2, 4, 5} ($\pm$)	Comments
DC Current ³ – Generate	(0 to 3.30) mA (0 to 33.00) mA (0 to 330.00) mA (0 to 2.20) A (0 to 11.00) A	0.25 μ A 0.017 mA 0.19 mA 0.39 mA 3.8 mA	Fluke 5500A/SC300
Resistance ³ – Measure	(0 to 10) Ω (0 to 100) Ω (0 to 1) k Ω (0 to 10) k Ω (0 to 100) k Ω (0 to 1) M Ω	2.9 m Ω 8.1 m Ω 0.57 Ω 0.57 Ω 5.8 Ω 0.63 k Ω	HP 34401A (4-wire)
Resistance ³ – Generate	(0 to 11.00) Ω (11 to 33.00) Ω (33 to 110.00) Ω (110 to 330.00) Ω (330 to 1.10) k Ω (1.1 to 3.30) k Ω (3.3 to 11.00) k Ω (11 to 33.00) k Ω (33 to 110.00) k Ω (110 to 330.00) k Ω 330 k Ω to 1.10 M Ω (1.1 to 3.30) M Ω (3.3 to 11.00) M Ω (11 to 33.00) M Ω (33 to 110.00) M Ω (110 to 330) M Ω	8.8 m Ω 16 m Ω 19 m Ω 30 m Ω 0.10 Ω 0.20 Ω 0.90 Ω 2.0 Ω 9.9 Ω 25 Ω 0.10 k Ω 0.10 k Ω 3.8 k Ω 23 k Ω 29 k Ω 89 k Ω	Fluke 5500A/SC300

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
Capacitance ³ – Generate	(0.33 to 0.49) nF (0.50 to 1.09) nF (1.10 to 3.29) nF (3.30 to 10.9) nF (11.0 to 32.9) nF (33 to 109.9) μ F (110 to 329.9) μ F (0.33 to 1.09) μ F (1.10 to 3.29) μ F	0.0059 nF 0.0061 nF 0.0063 nF 0.0096 nF 0.061 nF 0.083 nF 0.260 nF 0.0020 μ F 0.0083 μ F	Fluke 5500A/SC300

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of Thermocouple Devices ³ –			
Type J	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C	0.058 °C 0.058 °C 0.058 °C	Fluke 5500A/SC300
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1200) °C	0.058 °C 0.058 °C 0.058 °C	
Electrical Calibration of RTD Indicating Systems ³ –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 650) °C	0.09 °C 0.10 °C 0.13 °C 0.13 °C	
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 400) °C (400 to 600) °C	0.07 °C 0.10 °C 0.13 °C 0.13 °C	Fluke 5500A
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to 0) °C (0 to 300) °C (300 to 600) °C (600 to 600) °C	0.14 °C 0.14 °C 0.10 °C 0.13 °C 0.13 °C	
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 600) °C	0.07 °C 0.13 °C 0.17 °C	
Pt 385, 500 Ω	(-200 to 100) °C (100 to 260) °C (260 to 600) °C	0.07 °C 0.10 °C 0.11 °C	
Pt 385, 1 kΩ	(-200 to 100) °C (100 to 260) °C (260 to 600) °C	0.07 °C 0.08 °C 0.11 °C	

Parameter/Range	Frequency	CMC ^{2, 4} ($\pm$)	Comments
AC Voltage ³ – Measure 20 Hz to 100 kHz @ 60 Hz	(0 to 200.00) mV (0 to 2.00) V (0 to 20.00) V (0 to 200.00) V (0 to 700.00) V (0 to 6000) V	0.0092 mV 0.023 mV 0.030 mV 0.16 mV 2.4 mV 0.58 V	HP 34401A Fluke 87V & 80k-6 HV probe
AC Current ³ – Measure 20 Hz to 10 kHz	(0 to 200) mA (0 to 500) mA (0 to 1) A (0 to 2) A	0.44 μ A 0.31 mA 0.23 mA 0.42 mA	HP 34401A
AC Current ³ – Generate (0.030 to 0.33) mA (0.33 to 3.30) mA (3.3 to 33.00) mA (33 to 330.00) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz (10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.058 μ A 0.58 μ A 0.58 μ A 0.58 μ A 0.58 μ A 0.58 μ A 5.8 μ A 5.8 μ A 5.8 μ A 5.8 μ A 5.8 μ A	Fluke 5500A/SC300

Parameter/Range	Frequency	CMC ^{2, 4} ($\pm$)	Comments
AC Current ³ – Generate (cont)			
(0.33 to 2.20) A	(10 to 45) Hz (45 to 1) kHz (1 to 5) kHz	5.8 mA 5.8 mA 5.8 mA	Fluke 5500A/SC300
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	5.8 mA 5.8 mA 5.8 mA	
AC Voltage ³ – Generate			
(1.0 to 32.999) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.5 μ V 0.6 μ V 0.6 μ V 0.6 μ V 0.6 μ V 0.6 μ V	Fluke 5500A/SC300
(33 to 330.00) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.005 mV 0.005 mV 0.006 mV 0.006 mV 0.006 mV 0.006 mV	
(0.33 to 3.30) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.5 mV 0.5 mV 0.6 mV 0.6 mV 0.6 mV 1.1 mV	
(3.3 to 33.00) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.9 mV 0.9 mV 0.9 mV 1.5 mV 2.3 mV 2.3 mV	
(33 to 330.00) V	(45 to 1) kHz (1 to 10) kHz (10 to 20) kHz	11 mV 11 mV 11 mV	
(330 to 1000.00) V	(45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	66 mV 66 mV 66. mV	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Current Clamp Meter – AC Current (45 to 65) Hz DC Current	(10 to 16.5) A (16.5 to 150) A (150 to 550) A (10 to 16.5) A (16.5 to 150) A (150 to 550) A	0.20 % + 10 mA 0.20 % + 12 mA 0.22 % + 14 mA 0.20 % + 15 mA 0.20 % + 18 mA 0.20 % + 20 mA	Fluke 5500A w/ coil
Oscilloscope Calibration Amplitude Sinewave 1 MΩ Load 50 MΩ Load Square Wave Signal 50 Ω Load 1MΩ Load Triangle Wave 50 Ω Load 1 MΩ Load Time Marker > 1 Vpk	Up to 300 MHz 1.8 mV to 50 V pk-pk 1.8 mV to 2.5 V pk-pk 1.8 mV to 2.2 V pk-pk 1.8 mV to 105 V pk-pk 1.8 mV to 50 V pk-pk 1.8 mV to 2.5 V pk-pk 5 s to 100 μs 50 μs to 2 ns 1 μs to 2 ns (10 to 2) ns	3.7 % + 2.2 mV 4.5 % + 2.3 mV 3.5 % + 1 mV 4.3 % + 2.2 mV 3.5 % + 1 mV 4.3 % + 2.2 mV 2.5 % + 20 μs 0.32 % + 35 ns 0.03 % + 0.35 ns 0.003 % + 0.03 ns	Fluke 5500A/SC300

IV. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ –	HRBW: Low Medium High HRC: Low Medium High	0.66 HRBW 0.90 HRBW 0.92 HRBW 0.47 HRC 0.69 HRC 0.69 HRC	Indirect verification per ASTM E18

Parameter/Equipment	Range	CMC ² (±)	Comments
Scales & Balances ³	(0 to 6) kg (0 to 220) g (0 to 500) g (0 to 2) kg (0 to 35) kg (0 to 60) kg (0 to 120) kg (0 to 3000) kg (0 to 4500) kg (0 to 300) kg (0 to 600) kg (0 to 1200) kg	0.016 g 0.17 mg 1.5 mg 0.015 g 0.11 g 0.85 g 6.9 g 14 g 30 g 73 g 150 g 0.26 kg	ASTM E898, Class F1 weights M1 mass standards
Pressure Gages & Transducers ³ (4 to 20) mA	(0 to 15) psi (0 to 300) psi (0 to 1000) psi (0 to 3000) psi (0 to 5000) psi (0 to 10 000) psi	0.0049 psi 0.13 psi 1.1 psi 3.1 psi 1.1 psi 8.1 psi	Fluke 754/700P24 Fluke 754/700P27EX Fluke 754/700P08 Fluke 754/700P29 Fluke 754/700P30 Fluke 725/70
Hand Torque Tools, Torque Testers	(5 to 50) Nm (100 to 550) Nm (220 to 2200) Nm	0.13 Nm 1.8 Nm 4.3 Nm	ASME B107.300 torque transducer
Force Gages – Tension & Compression	(0 to 10) kN	0.018 kN	ASTM E74
Load Cells – Tension Compression	(0 to 20) kN (0 to 20) kN	0.035 kN 0.036 kN	ASTM E74 ASTM E4
UTM (Universal Testing Machine) Tension Compression	(0 to 50) kN (0 to 50) kN	0.032 kN 0.036 kN	ASTM E74 ASTM E4

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
IR Thermometers	(40 to 300) °C	1.3 °C	By comparison, with calibrated IR thermometer and plain surface black body
Thermometers by Comparison	(-5 to 140) °C	0.12 °C	Dry Well Jofra Ametek CTC-140A
	(30 to 320) °C	0.50 °C	Dry Well Jofra Ametek CTC-320 B
Temperature and Humidity Meter	(-20 to 60) °C	1.2 °C	By comparison Temperature and humidity meter as master
	(1 to 99) % HR	1.6 %	
Oven Calibration & Characterization (Up to 8 Channels)	(-200 to 300) °C	2.5 °C	Omega OM-HL-EH-TC, Omega USB TC08, thermocouples Type K
Temperature – Measuring Equipment ⁷	(-200 to 300) °C	1.2 °C	Fluke 52 II
	(-200 to 300) °C	0.7 °C	Fluke 745, thermocouple Type K
	(-35 to 500) °C	2.2 °C	IR thermometer TES 1327

VI. Time & Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Frequency ³ – Measuring Equipment ⁷	(0.01 to 119.99) Hz	63 µHz/Hz	Fluke 5500A/SC300

Parameter/Equipment	Range	CMC ² (±)	Comments
Stopwatch & Timers	(1 to 3600) s	0.21 s	Direct comparison to stopwatch and universal frequency counter, Fluke 5500A
Frequency – Measure ⁷	(1 to 2.4) GHz	1.5 µHz/Hz + 15 µHz	HP34401A Fluke 287

¹ This laboratory offers commercial 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. CMCs 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. 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 The measurands stated are generated with the Fluke 5500A series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

⁵ The measurands stated are measured with the HP 34401A. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. CMCs are expressed as either a specific value that covers the full range or as a combination of the fraction of the reading/output plus a range specification.

⁶ This scope meets A2LA's *P112 Flexible Scope Policy*.

⁷ The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.



Accredited Laboratory

A2LA has accredited

MARC INSTRUMENTS, S.A. DE C.V

Leon, Guanajuato, MEXICO

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and 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 29th day of July 2022.

A blue ink signature of a person, likely the Vice President of Accreditation Services, written over a horizontal line.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2747.01
Valid to September 30, 2024

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