



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: September 30, 2016

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 calibrations¹:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Coordinate Measuring Machine (CMM) ³ Length Measurement Error (E _L): Volumetric & Linear Repeatability (R ₀)	 Up to 300 mm Up to 500 mm Up to 750 mm Up to 750 mm ---	 0.69 µm 0.79 µm 0.95 µm 1.2 µm 1.5 µm	 ISO 10360-2 Step gage and step gage fixture
Calipers ³ – Vernier, Dial, and Digital	Up to 1000 mm (49 in)	8.6 µm	Step gage
Optical Comparators & Vision Systems – X & Y Axis Displacement	 Up to 300 mm	 3.5 µm	 JIS B 7184 table 1 Section 8 Glass scale

Parameter/Equipment	Range	CMC ² (±)	Comments
Micrometers ³	Up to 500 mm (0.001 in)	0.9 µm	Gage block set, Grade 0
Dial and Digital Indicators ³	Up to 25 mm x 0.01 m Up to 25 mm x 0.001 mm	5.7 µm 0.7 µm	Gage block set, Grade 0
Height Gage	Up to 1000 mm	6.0 µm	Step gage, surface plate
Surface Texture – Roughness, Ra, Fixed Point	2.94 µm	0.21 µm	Roughness specimen
Granite Surface Plate (Local Flatness Only)	Up to 2500 mm x 1600 mm	2.0 µm	JIS B7513, electronic indicator, repeat reading gage

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 4, 5, 6, 7} (±)	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	0.006 % + 3 µV + 0.6R 0.005 % + 5 µV + 0.6R 0.005 % + 50 µV + 0.6R 0.0055 % + 500 µV + 0.6R 0.0055 % + 1500 µV + 0.6R	Fluke 5500A/SC300
DC Voltage – 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	37 µV/V + 1.2 µV + 0.6R 25 µV/V + 4.0 µV + 0.6R 34 µV/V + 80 µV + 0.6R 28 µV/V + 600 µV + 0.6R 41 µV/V + 40 µV + 0.6R 1.0 % + 0.6R	Keithley 2001, HP 34401A Fluke 87V & 80k-6 HV probe

Parameter/Equipment	Range	CMC ^{2, 4, 5, 6, 7} ($\pm$)	Comments
DC Current – Measure	(0 to 200) μ A (0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A	0.05 % + 5 nA + 0.6R 0.04 % + 40 nA + 0.6R 0.04 % + 400 nA + 0.6R 0.05 % + 4.0 μ A + 0.6R 0.09 % + 40 μ A + 0.6R	Keithley 2001, HP 34401A
DC Current – 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	0.012 % + 0.05 μ A + 0.6R 0.01 % + 0.25 μ A + 0.6R 0.01 % + 3.3 μ A + 0.6R 0.03 % + 44 μ A + 0.6R 0.06 % + 330 μ A + 0.6R	Fluke 5500A/SC300
AC Voltage – 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 750.00) V (0 to 6000) V	0.30 % + 30 μ V + 0.6R 0.30 % + 0.30 mV + 0.6R 0.30 % + 3.0 mV + 0.6R 0.30 % + 30 mV + 0.6R 0.50 % + 100 mV + 0.6R 1.0 % + 0.6R	Keithley 2001, HP 34401A Fluke 87V & 80k-6 HV probe
AC Current ³ – Measure 20 Hz to 10 kHz	(0 to 200) μ A (0 to 2) mA (0 to 20) mA (0 to 200) mA (0 to 2) A	0.5 % + 30 nA + 0.6R 0.12 % + 0.30 μ A + 0.6R 0.12 % + 3.0 μ A + 0.6R 0.15 % + 30 μ A + 0.6R 0.45 % + 90 μ A + 0.6R	Keithley 2001, HP 34401A
Resistance – 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	6.4 $\mu\Omega/\Omega$ + 0.72 m Ω + 0.6R 18 $\mu\Omega/\Omega$ + 1.4 m Ω + 0.6R 38 $\mu\Omega/\Omega$ + 0.4 m Ω + 0.6R 13 $\mu\Omega/\Omega$ + 9.1 m Ω + 0.6R 42 $\mu\Omega/\Omega$ + 210 m Ω + 0.6R 78 $\mu\Omega/\Omega$ + 1 Ω + 0.6R	Keithley 2001, HP 34401A (4-wire)

Parameter/Equipment	Range	CMC ^{2, 4, 5, 7} ($\pm$)	Comments
Resistance – 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	0.012 % + 0.006 Ω + 0.6R 0.012 % + 0.015 Ω + 0.6R 0.009 % + 0.015 Ω + 0.6R 0.009 % + 0.015 Ω + 0.6R 0.009 % + 0.06 Ω + 0.6R 0.009 % + 0.06 Ω + 0.6R 0.009 % + 0.6 Ω + 0.6R 0.009 % + 0.6 Ω + 0.6R 0.011 % + 6 Ω + 0.6R 0.012 % + 6 Ω + 0.6R 0.015 % + 55 Ω + 0.6R 0.011 % + 55 Ω + 0.6R 0.06 % + 550 Ω + 0.6R 0.1 % + 550 Ω + 0.6R 0.5 % + 5.5 k Ω + 0.6R 0.5 % + 17 k Ω + 0.6R	Fluke 5500A/SC300
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	3.3 % 1.4 % 0.73 % 0.51 % 0.54 % 0.32 % 0.32 % 0.29 % 0.37 %	Fluke 5500A/SC300

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Devices ³ –			
Type J	-210 °C to -100 °C -100 °C to 760 °C 760 °C to 1200 °C	0.062 °C 0.064 °C 0.14 °C	Fluke 5500A/SC300
Type K	-200 °C to -100 °C -100 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.062 °C 0.064 °C 0.14 °C 0.14 °C	
Type S	0 °C to 250 °C 250 °C to 1400 °C 1400 °C to 1767 °C	0.062 °C 0.42 °C 0.62 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 400 °C	0.062 °C 0.062 °C 0.12 °C	
Electrical Calibration of RTD Indicating Systems –			
Pt 385, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.089 °C 0.11 °C 0.14 °C 0.14 °C 0.14 °C	Fluke 5500A
Pt 3926, 100 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 400 °C 400 °C to 630 °C	0.076 °C 0.11 °C 0.14 °C 0.14 °C	
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to 0 °C 0 °C to 300 °C 300 °C to 600 °C 600 °C to 630 °C	0.14 °C 0.14 °C 0.11 °C 0.14 °C 0.14 °C	
Pt 385, 200 Ω	-200 °C to 100 °C 100 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.070 °C 0.14 °C 0.17 °C 0.14 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicating Systems – (cont)			
Pt 385, 500 Ω	-200 °C to 100 °C 100 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.070 °C 0.098 °C 0.11 °C 0.13 °C	Fluke 5500A
Pt 385, 1 kΩ	-200 °C to 100 °C 100 °C to 260 °C 260 °C to 600 °C 600 °C to 630 °C	0.070 °C 0.098 °C 0.11 °C 0.13 °C	
PtNi 385, 100 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.098°C 0.16°C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.31°C	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
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	0.20 mV 0.20 mV 0.20 mV 0.20 mV 0.20 mV 0.20 mV	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	0.75 mV 0.75 mV 0.75 mV 0.75 mV 0.75 mV 0.75 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	7.0 mV 7.0 mV 7.0 mV 7.0 mV 7.0 mV 7.0 mV	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage ³ – Generate (cont)			
(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	0.10 V 0.10 V 0.10 V 0.10 V 0.10 V 0.10 V	Fluke 5500A/SC300
(33 to 330.00) V	(45 to 1) kHz (1 to 10) kHz (10 to 20) kHz	0.33 V 0.33 V 0.33 V	
(330 to 1000.00) V	(45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	3.0 V 3.0 V 3.0 V	
AC Current ³ – Generate			
(0.030 to 0.33) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	5.0 µA 5.0 µA 5.0 µA 5.0 µA 5.0 µA	Fluke 5500A/SC300
(0.33 to 3.30) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	30 µA 30 µA 30 µA 30 µA 30 µA	
(3.3 to 33.00) mA	(10 to 20) Hz (20 to 45) Hz (45 to 1) kHz (1 to 5) kHz (5 to 10) kHz	300 µA 300 µA 300 µA 300 µA 300 µA	
(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	3.0 mA 3.0 mA 3.0 mA 3.0 mA 3.0 mA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current ³ – Generate (cont)			
(0.33 to 2.20) A	(10 to 45) Hz (45 to 1) kHz (1 to 5) kHz	20 mA 20 mA 20 mA	Fluke 5500A/SC300
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz (500 to 1) kHz	40 mA 40 mA 40 mA	

III. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Indirect Verification of Rockwell Hardness Testers ³ –	HRBW: (40 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW HRC: (20 to 30) HRC (35 to 55) HRC (59 to 65) HRC	0.69 HRBW 0.69 HRBW 0.47 HRBW 0.69 HRC 0.69 HRC 0.47 HRC	ASTM E18
Scales & Balances ³	1 mg to 100 g (1 to 500) g (1000 to 6000) g	0.083 mg 0.83 mg 8.3 mg	ASTM E898, Class F1 weights
Pressure Gages –			
Gage & Difference	Up to 500 psi	1.2 psi	DMM Fluke 87 V pressure module, Fluke PV-350
	Up to 5000 psi	1.1 psi	Fluke 717 5000G
Atmospheric Pressure (Negative Pressure)	(0 to 29) inHg	0.10 inHg	DMM Fluke 87 V, Fluke PV-350
Transducers	(4 to 20) mA	0.015 % + 0.002 mA	Fluke 717 5000G

Parameter/Equipment	Range	CMC ² (±)	Comments
Torque Wrenches	(0 to 50) Nm	0.16 Nm CW 0.13 Nm CCW	ASME B107.14M torque transducer

IV. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Frequency ³ – Measuring Equipment	(0.01 to 119.99) Hz (120.0 to 1199.9) Hz (1.200 to 11.999) kHz (12.00 to 119.99) kHz (120.0 to 1199.9) kHz (1.200 to 2.000) MHz	25 µHz/Hz + 2 mHz 25 µHz/Hz + 2 mHz 25 µHz/Hz + 2 mHz 25 µHz/Hz + 2 mHz 25 µHz/Hz + 2 mHz 25 µHz/Hz + 2 mHz	Fluke 5500A/SC300

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 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, R represents the resolution of the device being calibrated.

⁵ 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.

⁶ 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.

⁷ In the statement of CMC, percentages are to be read as percent of reading unless otherwise indicated.



American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MARC INSTRUMENTS, S.A. DE C.V

Celaya, Guanajuato Mexico

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 the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. 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 21st day of October 2014.



A handwritten signature in black ink, reading "Peter Meyer".

President & CEO
For the Accreditation Council
Certificate Number 2747.01
Valid to September 30, 2016

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