



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

CAL-CERT COMPANY
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CALIBRATION

Valid To: November 30, 2018

Certificate Number: 4986.01

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
Micrometers ³ –	Up to 1 in	600 µin	CP-010, gage blocks
Calipers, Micrometers ³	Up to 12 in (12 to 24) in (24 to 48) in	800 µin 1000 µin 1800 µin	CP-008, CP-010, gage blocks
Dial Indicators ³	Up to 6 in	65 µin	CP-009, gage blocks
LVDTs ³	Up to 1 in	60 µin	CP-009, gage blocks
Extensometers/ Deflectometers ³	Up to 1 in	110 µin	CP-007, linear calibrator
Displacement Measurement ³	Up to 24 in	20 µin	CP-115
Surface Plates (Metal and Granite) ³	Up to 60 ft ² area	2 µin per in of diagonal	CP-128, leveling system

Parameter/Equipment	Range	CMC ² (±)	Comments
Pin Gages	Up to 4 in	11 μin	CP-115, super mic, gage blocks
Thread Gages/Wires	Up to 4 in	11 μin	CP-115, super mic, gage blocks
Plug Gages	Up to 4 in	11 μin	CP-115, super mic, gage blocks
Radius Gages, Angle	Up to 4 in	11 μin	CP-115, optical comparator, gage blocks
Micrometer Standards	Up to 20 in	60 μin	CP-115, height gage, gage blocks, surface plate
Gage Blocks	Up to 4 in	11 μin	CP-115 gage block comparator, master gage blocks
Height Gages ³	Up to 40 in	60 μin	CP-115, surface plates, gage blocks
Rulers ³	Up to 84 in	180 μin	CP-115, gage blocks
Tape Measures ³	Up to 100 ft	0.032 in	CP-115, standard rule, gage blocks
Straight Edges ³	Up to 25 in	60 μin	CP-115, super mic, gage blocks
Optical Comparator ³	Various Ranges Up to 50x	18 μin	CP-064, standards

II. Dimensional Inspection

Parameter/Equipment	Range	CMC ² (±)	Comments
1-Dimensional Inspection ^{3,4}	Up to 12 in	600 µin	CP-115, ASTM and AASHTO procedures, calipers, rulers, straight edges, gage blocks

III. Electrical DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
DC Voltage – Generate ³	Up to 329.9999 mV 330 mV to 3.299 999 V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1020) V	0.006 % + 3 µV 0.005 % + 5 µV 0.005 % + 50 µV 0.0055 % + 500 µV 0.0055 % + 1500 µV	CP-033, Fluke 5500A
DC Current – Generate ³	Up to 3.29999 mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 2.199 99 A (2.2 to 11) A	0.013 % + 0.05 µA 0.01 % + 0.25 µA 0.01 % + 3.3 µA 0.03 % + 44 µA 0.06 % + 330 µA	CP-033, Fluke 5500A

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Generate ³ (1.0 to 32.99) 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	0.35 % + 20 µV 0.15 % + 20 µV 0.2 % + 20 µV 0.25 % + 20 µV 0.35 % + 33 µV 1 % + 60 µV	CP-033, Fluke 5500A

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Generate ³ (cont)			
(33 to 329.999) 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	0.25 % + 50 μV 0.05 % + 20 μV 0.1 % + 20 μV 0.16 % + 40 μV 0.24 % + 170 μV 0.7 % + 330 μV	CP-033, Fluke 5500A
(0.33 to 3.29999) 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	0.15 % + 250 μV 0.03 % + 60 μV 0.08 % + 60 μV 0.14 % + 300 μV 0.24 % + 1700 μV 0.5 % + 3300 μV	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.15 % + 250 μV 0.04 % + 600 μV 0.08 % + 2600 μV 0.19 % + 5000 μV 0.24 % + 17 000 μV	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.05 % + 6.6 μV 0.08 % + 15 μV 0.09 % + 33 μV	
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.05 % + 80 μV 0.20 % + 100 μV 0.20 % + 500 μV	
AC Current – Generate ³			
(0.029 to 0.32999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.25 % + 0.15 μA 0.13 % + 0.15 μA 0.13 % + 0.25 μA 0.4 % + 0.15 μA 1.3 % + 0.15 μA	CP-033, Fluke 5500A
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.2 % + 0.3 μA 0.1 % + 0.3 μA 0.1 % + 0.3 μA 0.2 % + 0.3 μA 0.6 % + 0.3 μA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current – Generate ³ (cont)			
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.2 % + 3 μA 0.1 % + 3 μA 0.09 % + 3 μA 0.2 % + 3 μA 0.6 % + 3 μA	CP-033, Fluke 5500A
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.2 % + 30 μA 0.1 % + 30 μA 0.09 % + 30 μA 0.2 % + 30 μA 0.6 % + 30 μA	
(0.33 to 2.199 99) A	(10 to 20) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.2 % + 300 μA 0.1 % + 300 μA 0.75 % + 300 μA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.06 % + 2000 μA 0.10 % + 2000 μA 0.33 % + 2000 μA	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Resistance – Generate ³	(0 to 10.99) Ω (11 to 32.999) Ω (33 to 109.999) Ω (110 to 329.999) Ω 330 Ω to 1.099 99 kΩ (1.1 to 3.299 99) kΩ (3.3 to 10.9999) kΩ (11 to 32.9999) kΩ (33 to 109.999) kΩ (110 to 329.999) kΩ 330 kΩ to 1.099 99 MΩ (1.1 to 3.299 99) MΩ (3.3 to 10.9999) MΩ (11 to 32.9999) MΩ (33 to 109.999) MΩ (110 to 330) MΩ	0.012 % + 0.008 Ω 0.012 % + 0.015 Ω 0.009 % + 0.015 Ω 0.009 % + 0.015 Ω 0.009 % + 0.06 Ω 0.009 % + 0.06 Ω 0.009 % + 0.6 Ω 0.009 % + 0.6 Ω 0.011 % + 6 Ω 0.012 % + 6 Ω 0.015 % + 55 Ω 0.015 % + 55 Ω 0.06 % + 550 Ω 0.1 % + 550 Ω 0.5 % + 5.5 kΩ 0.5 % + 17 kΩ	CP-033, Fluke 5500A

Parameter/Equipment	Range	CMC ^{2,5} (\pm)	Comments
DC Voltage – Measure ³	Up to 329.9999 mV 330 mV to 3.299 999 V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1020) V	0.006 % + 3 μ V 0.005 % + 5 μ V 0.005 % + 50 μ V 0.0055 % + 500 μ V 0.0055 % + 1500 μ V	CP-033, Keithley 2002
DC Current – Measure ³	Up to 3.299 99 mA (3.3 to 32.9999) mA (33 to 329.999) mA 330 mA to 2.199 99 A (2.2 to 11) A	0.013 % + 0.05 μ A 0.01 % + 0.25 μ A 0.01 % + 3.3 μ A 0.03 % + 44 μ A 0.06 % + 330 μ A	CP-033, Keithley 2002

Parameter/Range	Frequency	CMC ^{2,5} (\pm)	Comments
AC Voltage – Measure ³			
(1.0 to 32.99) 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	0.35 % + 20 μ V 0.15 % + 20 μ V 0.2 % + 20 μ V 0.25 % + 20 μ V 0.35 % + 33 μ V 1 % + 60 μ V	CP-033, Keithley 2002
(33 to 329.999) 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	0.25 % + 50 μ V 0.05 % + 20 μ V 0.1 % + 20 μ V 0.16 % + 40 μ V 0.24 % + 170 μ V 0.7 % + 330 μ V	
(0.33 to 3.299 99) 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	0.15 % + 250 μ V 0.03 % + 60 μ V 0.08 % + 60 μ V 0.14 % + 300 μ V 0.24 % + 1700 μ V 0.5 % + 3300 μ V	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.15 % + 250 μ V 0.04 % + 600 μ V 0.08 % + 2600 μ V 0.19 % + 5000 μ V 0.24 % + 17 000 μ V	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Measure ³ (cont)			
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.05 % + 6.6 μV 0.08 % + 15 μV 0.09 % + 33 μV	CP-033, Keithley 2002
(330 to 1000) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.05 % + 80 μV 0.20 % + 100 μV 0.20 % + 500 μV	

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Pressure Gages and Transducers ³	(0 to 10 000) psi	0.57 psi	CP-003, pressure calibrator
Pressure Gages – Nitrogen	(0 to 3000) psi	0.57 psi	CP-003, pressure calibrator
Vacuum ³	(0 to 30) in-Hg	0.75 in-Hg	CP-005, digital manometers
Manometers, Absolute Pressure ³	(1000 to 0) mm-HG ABS	0.1 %	CP-005, digital manometers
Force – Load Cells Compression	(0 to 600 000) lbf	0.02 %	CP-001, ASTM E74, load cells/weights
Force – Load Cells Tension	(0 to 100 000) lbf	0.02 %	CP-001, ASTM E74, load cells/weights
Force Devices and Machines – Compression ³	(0 to 1 000 000) lbf	0.05 %	CP-001, ASTM E4, load cells/weights

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Force Devices and Machines – Tension ³	(0 to 200 000) lbf	0.05 %	CP-001, ASTM E4, load cells/weights
Torque – Wrenches, Screw Drivers, and Multipliers ³	(0 to 100) lbf·in (>100 to 750) lbf·in (0 to 250) lbf·ft (>250 to 1000) lbf·ft	0.04 % 0.04 % 0.04 % 0.04 %	CP-006 torque transducers
Balances/Scales ³	Up to 150 kg Up to 5000 lb	3.5 g 0.5 lb	CP-002, class 1, 4, and F weights
Volume – Volume Measurement ³	Up to 15 ft ²	0.7 %	CP-038 thermometer, balance
Indirect Verification of Rockwell Hardness ³	HRA: Low Medium High HRB: Low Medium High HRC: Low Medium High HRE: Low Medium High HRF: Low Medium High HR15N: Low Medium High	0.8 HRA 0.8 HRA 0.8 HRA 1.6 HRB 1.6 HRB 1.6 HRB 1 HRC 1 HRC 1 HRC 1.9 HRE 1.9 HRE 1.9 HRE 1.6 HRF 1.6 HRF 1.6 HRF 0.8 HR15N 0.8 HR15N 0.8 HR15N	CP-004 Rockwell hardness blocks

Parameter/Equipment	Range	CMC ² (±)	Comments
Indirect Verification of Rockwell Hardness ³ (cont)	HR30N: Low Medium High HR45N: Low Medium High HR15T: Low Medium High HR30T: Low Medium High HR45T: Low Medium High	1.2 HR30N 1.2 HR30N 1.2 HR30N 0.8 HR45N 0.8 HR45N 0.8 HR45N 1.3 HR15T 1.3 HR15T 1.3 HR15T 1.3HR30T 1.3HR30T 1.3HR30T 2.2 HR45T 2.2 HR45T 2.2 HR45T	CP-004 Rockwell hardness blocks
Indirect Verification of Micro Hardness – Vickers ³	(100 to 249) HV (250 to 600) HV >600 HV	12 HV 5.3 HV 29 HV	CP-004, blocks
Indirect Verification of Micro Hardness – Knoop ³	(100 to 600) HV (>600 to 1100) HV	7.0 HV 17 HV	CP-004, blocks
Brinell Hardness ³	320 HBW	1.8 HBW	CP-014 Brinell hardness blocks

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Ovens, Freezers, Environmental Chambers, Autoclaves, Water Baths, and Sealers ³	(-200 to 600) °C	1.2 °C	CP-011, thermocouple/RTD meters
Thermometers, Digital – Generate ³	(-200 to 600) °C	1.2 °C	CP-012, thermocouple/RTD meters
Thermometers ³	(-200 to 300) °C	0.01 °C	CP-012 RTD meters, probes, baths
Thermocouples – Generate and Measure ³ Type B Type E Type J Type K Type N Type R Type S Type T	(1200 to 3200) °F (-400 to 1800) °F (-200 to 1200) °F (-300 to 2400) °F (-300 to 2350) °F (30 to 3200) °F (30 to 3200) °F (400 to 600) °F	0.12 °F 0.19 °F 0.19 °F 0.19 °F 0.19 °F 0.31 °F 0.19 °F 0.13 °F	CP-013, thermocouple/RTD meters
IR Thermometers/Pyrometers ³	(50 to 900) °C	0.11 °C	CP-012, black body, PRT, reference pyrometer
Temperature Uniformity (Up to 60 Channels) ³	(0 to 2400) °F	0.2 °F	CP-011, data loggers, thermocouples AMS 2750 and CQI-9
Relative Humidity ³	(20 to 95) %	1 % RH	CP-031, digital hygrometer

Parameter/Equipment	Range	CMC ² (±)	Comments
Hydrometry – Specific Gravity, Hydrometers and Equivalent Values in Other Hydrometer Scales	(>0.631 to 1.474) SG (>1.475 to 2) SG	0.000 19 SG 0.000 33 SG	CP-020 hydrometer standards, PRT, and ASTM E126

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Timers, Stop Watches ³	(0 to 10) hrs Up to 24 hrs	0.7 s	CP-032 digital stopwatch CP-032 VWR bench timer/stopwatch/data logger
RPM (Indirect) ³	99 999 RPM	0.005 %	CP-033, Fluke 5500A

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 Dimensional Inspection refers to the measurement and verification of Sieves, liquid limit devices, grooving tools, followers, plunger, metal specimens, Kelly ball, LA Abrasion, Marshall and proctor hammers, platens, expansion racks, slump cones, tampers, 123 blocks, and sample splitters

⁵ 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 percent or fraction of the reading plus a fixed floor specification.

⁶ In the statement of CMC, SG is the numerical value of the specific gravity.

⁷ In the statement of CMC, percentages are percentages of reading unless otherwise noted.



Accredited Laboratory

A2LA has accredited

CAL-CERT COMPANY

Milwaukie, OR

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 3rd day of May 2018.

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

President and CEO
For the Accreditation Council
Certificate Number 4986.01
Valid to November 30, 2018

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