



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

MICRO PRECISION CALIBRATION
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CALIBRATION

Valid To: July 31, 2013

Certificate Number: 0935.09

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 ^{2,6} (±)	Comments
Calipers ³	(0.10 to 36) in	(720 μin + 2.5L) μin	Mitutoyo gage blocks
Height Gages ³	(Up to 24) in	(70 + 2.5L) μin	Mitutoyo gage blocks
Gage Blocks	(Up to 4) in	(4 + 2.5L) μin	Federal gage block comparator and master gage blocks
Cylindrical Plug Gages	(Up to 12) in	160 μin	Sip measuring machine

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Thread Plug Gages – Pitch Diameter	(Up to 12) in	68 μin	Sip measuring machine
Ring Gauges, Cylindrical & Tapered	(0.02 to 12) in	(11 + 1.5L) μin	Sip measuring machine
Indicators – Resolution 0.00005 in	(Up to 4) in	(68 + 2.5L) μin	Sip measuring machine
End Measuring Rods	(Up to 12) in	(120 + 2.5L) μin	Sip measuring machine
Pin Gages, Diameter	(0.02 to 2.00) in	32 μin	Sip measuring machine
Micrometers ³ – Length and Flatness, Resolution: 50 μin	(0.10 to 12) in	(67 + 2.5L) μin	Mitutoyo gage blocks, optical flat, monochromic light source

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate ³	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	11 μV/V + 0.6 μV 10 μV/V + 1.0 μV 11 μV/V + 3.5 μV 10 μV/V + 6.5 μV 11 μV/V + 80 μV 13 μV/V + 500 μV	Fluke 5700A w/option 03

Parameter/Equipment	Range	CMC ^{2,4,5,7} (\pm)	Comments
DC Voltage – Measure ³	(0 to 100) mV 100 mV to 1V (1 to 10) V (10 to 100) V (100 to 1000) V	13 μ V/V + 3.0 μ V 17 μ V/V + 0.3 μ V 13 μ V/V + 0.5 μ V 15 μ V/V + 30 μ V 27 μ V/V + 100 μ V	HP 3458A
DC Current – Generate ³	(0 to 220) μ A 220 μ A to 22 mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A	50 μ A/A + 8 nA 50 μ A/A + 8 nA 50 μ A/A + 80 nA 60 μ A/A + 0.8 μ A 80 μ A/A + 25 μ A	Fluke 5700A w/option 03
High DC Current ³	(1 to 500) A	0.9 %	Fluke 5500A w/ current coil hall effect
DC Current – Measure ³	Up to 100 nA 100 nA to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 10 mA (10 to 100) mA 100 mA to 1 A	35 μ A/A + 400 μ A 25 μ A/A + 40 μ A 25 μ A/A + 10 μ A 25 μ A/A + 5 μ A 25 μ A/A + 5 μ A 40 μ A/A + 5 μ A 0.012 % + 10 μ A	HP 3458A
Resistance – Generate ³	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 to 1.1) k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω 0.33 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω	0.014 % + 0.008 Ω 0.014 % + 0.015 Ω 0.01 % + 0.015 Ω 0.01 % + 0.015 Ω 0.01 % + 0.015 Ω 0.01% + 0.06 Ω 0.01 % + 0.06 Ω 0.011 % + 0.6 Ω 0.013 % + 0.6 Ω 0.013 % + 6 Ω 0.017 % + 55 Ω 0.017 % + 55 Ω 0.062 % + 0.55 k Ω 0.11 % + 0.55 k Ω 0.51 % + 5.5 k Ω 0.52 % + 15.6 k Ω	Fluke 5500A

Parameter/Equipment	Range	CMC ^{2,4,5,7} (\pm)	Comments
Resistance (cont.) – Generate, Fixed Points ³	1 Ω 10 Ω 100 Ω 1 k Ω 10 k Ω 100 k Ω 1 M Ω 10 M Ω 100 M Ω	97 $\mu\Omega/\Omega$ 39 $\mu\Omega/\Omega$ 24 $\mu\Omega/\Omega$ 18 $\mu\Omega/\Omega$ 17 $\mu\Omega/\Omega$ 19 $\mu\Omega/\Omega$ 27 $\mu\Omega/\Omega$ 54 $\mu\Omega/\Omega$ 0.016 %	Fluke 5700A w/option 03
Resistance – Measure ³	(0 to 10) Ω (10 to 100) Ω (100 to 1.0) k Ω (1.0 to 10) k Ω (10 to 100) k Ω (.1 to 1.0) M Ω (1.0 to 10) M Ω (10 to 100) M Ω (0.1 to 1.0) G Ω	20 $\mu\Omega/\Omega + 0.05$ m Ω 16 $\mu\Omega/\Omega + 0.5$ m Ω 13 $\mu\Omega/\Omega + 0.5$ m Ω 12 $\mu\Omega/\Omega + 5.0$ m Ω 13 $\mu\Omega/\Omega + 0.05$ m Ω 24 $\mu\Omega/\Omega + 2$ Ω 65 $\mu\Omega/\Omega + 100$ Ω 0.06 % + 1 k Ω 5.8 % + 10 k Ω	HP 3458A
Capacitance – Generate ³	(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
Inductance – Generate ³ Fixed Points	5.0 mH 100 mH 1 H	0.059 % 0.062 % 0.082 %	Genrad 1482
Electrical Calibration of Thermocouple Indicators ³ – Type E	-250 $^{\circ}$ C to -100 $^{\circ}$ C -100 $^{\circ}$ C to 650 $^{\circ}$ C 650 $^{\circ}$ C to 1000 $^{\circ}$ C	0.5 $^{\circ}$ C 0.16 $^{\circ}$ C 0.21 $^{\circ}$ C	Fluke 5500A

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators ³ (cont.) –			
Type J	-210 °C to -100 °C -100 °C to 760 °C 760 °C to 1200 °C	0.27 °C 0.17 °C 0.23 °C	Fluke 5500A
Type K	-200 °C to -100 °C -100 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.33 °C 0.18 °C 0.26 °C 0.04 °C	
Type S	0 °C to 250 °C 250 °C to 1400 °C 1400 °C to 1767 °C	0.47 °C 0.37 °C 0.46 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 400 °C	0.63 °C 0.24 °C 0.16 °C	
Electrical Calibration of RTD Indicating Systems ³ –			
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	0.05 °C 0.07 °C 0.1 °C 0.12 °C 0.23 °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	0.05 °C 0.07 °C 0.1 °C 0.12 °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	0.25 °C 0.05 °C 0.08 °C 0.1 °C 0.23 °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	0.04 °C 0.05 °C 0.14 °C 0.16 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicating Systems ³ (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	0.05 °C 0.06 °C 0.09 °C 0.11 °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	0.03 °C 0.05 °C 0.07 °C 0.23 °C	
PtNi 385, 100 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.08 °C 0.14 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.3 °C	

Parameter/Range	Frequency	CMC ^{2,4,7} (±)	Comments
AC Voltage – Generate ³			
(0 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz 100 kHz to 1 MHz	0.055 % + 13 μV 0.021 % + 8 μV 0.011 % + 8 μV 0.037 % + 8 μV 0.085 % + 25 μV 0.34 % + 80 μV	Fluke 5700A w/option 03
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz 100 kHz to 1 MHz	0.05 % + 80 μV 0.016 % + 25 μV 75 μV/V + 6 μV 0.012 % + 16 μV 0.025 % + 70 μV 0.22 % + 850 μV	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz 100 kHz to 1 MHz	0.05 % + 0.8 mV 0.016 % + 0.25 mV 75 μV/V + 0.06 mV 0.012 % + 0.16 mV 0.025 % + 0.35 mV 0.34 % + 8.5 mV	

Parameter/Range	Frequency	CMC ^{2, 4, 5, 7} (\pm)	Comments
AC Voltage (cont.) – Generate ³			
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz 100 kHz to 1 MHz	0.05 % + 8 mV 0.016 % + 2.5 mV 80 μ V/V + 0.8 mV 0.022 % + 3.5 mV 0.05 % + 8 mV 1.6 % + 190 mV	Fluke 5700A w/option 03
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.06 % + 11 mV 0.23 % 45 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.04 % + 16 mV 90 μ V/V + 4 mV	
AC Voltage – Measure ³			
Up to 10 mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 3 μ V 0.02 % + 2 μ V 0.03 % + 2 μ V 0.12 % + 2 μ V 0.58 % + 2 μ V 4.6 % + 2 μ V	HP 3458A, synchronous sub- sampled mode
10 mV to 10 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	80 μ V/V + 0.4 mV 80 μ V/V + 0.2 mV 0.02 % + 0.2 mV 0.03 % + 0.2 mV 0.09 % + 0.2 mV 0.35 % + 1 mV 1.2 % + 1 mV 1.7 % + 1 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.02 % + 4 mV 0.02 % + 2 mV 0.04 % + 2 mV 0.14 % + 2 mV 0.46 % + 10 mV 1.7 % + 10 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz	0.05 % + 40 mV 0.05 % + 20 mV 0.07 % + 20 mV	
(1 to 20) kV	(20 to 50) kHz (50 to 100) kHz	0.14 % + 20 mV 0.35 % + 20 mV	

Parameter/Range	Frequency	CMC ^{2, 4, 5, 7} (\pm)	Comments
AC Current– Generate ³ (1 to 220) μ A 220 μ A to 22 mA (22 to 220) mA 220 mA to 2.2 A (1 to 500) A	40 Hz to 1 kHz (50 to 70) Hz	0.09 % 0.024 % 0.026 % 0.093 % 1.8 %	Fluke 5700A w/option 03 Fluke 5500 with Fluke coil
AC Current ³ – Measure Up to 100 μ A 100 μ A to 100 mA 100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.03 μ A 0.18 % + 0.03 μ A 0.078 % + 0.03 μ A 0.46 % + 20 μ A 0.17 % + 20 μ A 0.073 % + 20 μ A 0.042 % + 20 μ A 0.46 % + 200 μ A 0.19 % + 200 μ A 0.1 % + 200 μ A 0.12 % + 200 μ A	HP 3458A

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ² (\pm)	Comments
RF Tuned Power Relative – Measure ³ (-0.0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (- 80 to -90) dB	2.5 MHz to 26.5 GHz	0.06 dB 0.08 dB 0.09 dB 0.12 dB 0.15 dB 0.17 dB 0.20 dB 0.25 dB 0.25 dB	HP 8902A, HP11793A

Parameter/Range	Frequency	CMC ^{2,7} (\pm)	Comments
RF Tuned Power Relative (cont) – Measure ³ (-90 to -100) dB (-100 to -110) dB (-110 to -120) dB	2.5 MHz to 26.5 GHz	0.27 dB 0.32 dB 0.37 dB	HP 8902A, HP11793A
RF Power ³ – Measure, Absolute RF (-30 to -20) dBm (10 to 20) dBm	50 MHz to 50 GHz 50 MHz to 50 GHz	0.65 dBm 1.2 dB	HP 438A, 8482A 8485A, 8487A
Amplitude Modulation – Measure ³ Rate: 150 kHz to 10 MHz Depth: (5 to 99) % Rate: 10 MHz to 1.3 GHz Depth: (5 to 99) %	50 Hz to 10 kHz 20 Hz to 10 kHz 50 Hz to 10 kHz 20 Hz to 10 kHz	2 % + 1 digit of rdg 3 % + 1 digit of rdg 1 % + 1 digit of rdg 3 % + 1 digit of rdg	HP 8902A
Frequency Modulation – Measure ³ Rate: 250 kHz to 10 MHz Dev: \leq 40 kHz Rate: 10 MHz to 1.3 GHz Dev: \leq 400 kHz	50 Hz to 10 kHz 50 Hz to 100 kHz 20 Hz to 200 kHz	2 % + 1 digit of rdg 1 % + 1 digit of rdg 5 % + 1 digit of rdg	HP 8902A

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Torque ³ – Measure	(Up to 400) in·oz (Up to 50) in·lb (Up to 150) in·lb (Up to 400) in·lb (Up to 600) ft·lb	0.83 % 0.92 % 0.7 % 0.66 % 0.68 %	CDI torque system
Scales and Balances ³	1mg to 30 kg	1.0 LSVD	Verification with class 1 weights
	(10 to 1000) lb	0.00067 lb	Class F weights
Pressure – Measure ³	(-15 to 100) psi Up to 1000 psi Up to 10 000 psi	0.1 % 0.09 % 0.15 %	Heise PTE-1 Fluke 700P08 Heise HQS-2-B-I-G

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Humidity – Measuring Equipment	11 % RH 33 % RH 75 % RH 97 % RH	2.1 % RH 2.0 % RH 2.0 % RH 2.5 % RH	Saturated salt solutions
Field Service ³	(11 % to 95 %) RH	4.3 % RH	Vaisala HMI 41, HMP 46
Temperature – Measuring Equipment	(-20 to 300) °C	0.53 °C	SPRT and Hart 9105 calibrator

VI. Time & Frequency

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Frequency – Measuring Equipment	10 MHz	6×10^{-10} Hz/Hz	HP 58503A, GPS

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

² Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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 The measurands stated are generated with the Fluke 5500A, Fluke 5700A series of instruments. This capability is suitable for the calibration of the devices intended to measure the stated measurand in the ranges indicated. Calibration and Measurement Capabilities (CMC) 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 3458A series of instruments. This capability is suitable for the calibration of the devices intended to generate the measurand in the ranges indicated. Calibration and Measurement Capabilities (CMC) 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 In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches. D is the numerical value of the nominal diameter of the device measured in inches. Pitch diameter is measured by the three-wire method.

⁷ In the statement of CMC, the value is defined as the percentage of reading.



World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICRO PRECISION CALIBRATION, INC.

Tampa, FL

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 19th day of September 2011.





Peter Meyer

President & CEO
For the Accreditation Council
Certificate Number 935.09
Valid to July 31, 2013

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