



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

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CALIBRATION

Valid To: October 31, 2012

Certificate Number: 0935.08

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 & Height Gages ³	(0.10 to 24) in	(56 + 0.6L) μin	Mitutoyo gage blocks
Gage Blocks	(0 to 12) in	(5.7 + 1.6L) μin	P&W labmaster and master gage blocks
Cylindrical Plug Gages	(0 to 12) in	(5.6 + 1.2L) μin	P&W labmaster and master gage blocks
Thread Plug Gages – Major Diameter Pitch Diameter	(0 to 12) in	(15 + 1.2L) μin (62 + 1.2L) μin	P&W labmaster
Ring Gauges, Cylindrical & Tapered	(0.02 to 12) in	(30 + 1.2L) μin	P&W labmaster

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Indicators, Resolution – 0.00005 in 0.0001 in 0.001 in	(0 to 1) in (0 to 2) in (0 to 8) in	59 μin 82 μin 210 μin	P&W labmaster and master gage blocks
End Measuring Rods	(0 to 12) in	(5.7 + 1.2L) μin	P&W labmaster and master gage blocks
Pin Gages, Diameter	(0.02 to 2.00) in	40 μin	P&W labmaster and master gage blocks
Micrometers ³ – Length and Flatness Resolution: 100 μin, 50 μin	Up to 4 in	(60 + 2.6L) μin (132 + 3L) μin	Mitutoyo gage blocks, optical flat, monochromic light source
Pitch Diameter, External Threads	(0.10 to 4.00) in	(61 + 1.2L) μin	P&W labmaster and thread wires (three wire method)

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	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	12 μV/V + 0.6 μV 12 μV/V + 1.0 μV 11 μV/V + 3.5 μV 12 μV/V + 6.5 μV 13 μV/V + 80 μV 13 μV/V + 500 μV	Fluke 5700A
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 μV/V + 3.0 μV 17 μV/V + 0.3 μV 13 μV/V + 0.5 μV 15 μV/V + 30 μV 27 μV/V + 100 μV	HP 3458A

Peter Abney

Parameter/Equipment	Range	CMC ^{2, 4, 5, 7} (\pm)	Comments
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	40 μ A/A + 8 nA 40 μ A/A + 8 nA 44 μ A/A + 80 nA 47 μ A/A + 0.8 μ A	Fluke 5700A w/option 03
	(2.2 to 11) A (11 to 20.5) A	55 μ A/A + 25 μ A 1.0 mA/A + 750 μ A	Fluke 5500A
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
High DC Current	(1 to 500) A	0.72 %	Fluke 5500A with current coil hall effect
Resistance – 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	0.013 % 26 $\mu\Omega/\Omega$ 28 $\mu\Omega/\Omega$ 20 $\mu\Omega/\Omega$ 18 $\mu\Omega/\Omega$ 19 $\mu\Omega/\Omega$ 26 $\mu\Omega/\Omega$ 50 $\mu\Omega/\Omega$ 0.012 %	Fluke 5700A w/option 03
Resistance – Measure ³	(1 to 10) Ω 10 Ω to 100 Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω 1 M Ω to 10 M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	13 $\mu\Omega/\Omega$ + 74 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ + 100 $\mu\Omega/\Omega$ 13 $\mu\Omega/\Omega$ + 73 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ + 80 $\mu\Omega/\Omega$ 9.0 $\mu\Omega/\Omega$ + 120 $\mu\Omega/\Omega$ 17 $\mu\Omega/\Omega$ + 2 $\mu\Omega$ 57 $\mu\Omega/\Omega$ + 110 $\mu\Omega$ 0.05 % + 4.3 k Ω 0.58 % + 290 k Ω	HP 3458A

Parameter/Equipment	Range	CMC ^{2,4,7} (±)	Comments
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) μF (110 to 329.9) μF (0.33 to 1.09) μF (1.10 to 3.29) μF	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	1.0 mH 10 mH 100 mH 1 H	0.054 % 0.065 % 0.059 % 0.075 %	Genrad 1482
Electrical Calibration of Thermocouple Indicators ³ –			
Type E	-250 °C to -100 °C -100 °C to 650 °C 650 to 1000 °C	0.56 °C 0.54 °C 0.53 °C	Fluke 5500A
Type J	-210 °C to -100 °C -100 °C to 760 °C 760 °C to 1200 °C	0.48 °C 0.45 °C 0.43 °C	
Type K	-200 °C to -100 °C -100 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.48 °C 0.44 °C 0.46 °C 0.47 °C	
Type S	0 °C to 250 °C 250 °C to 1400 °C 1400 °C to 1767 °C	0.48 °C 0.47 °C 0.54 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 400 °C	0.56 °C 0.52 °C 0.58 °C	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation 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 0.10 °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 0.10 °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 0.10 °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	
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	
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, 5,7} (\pm)	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 μ V 0.021 % + 8 μ V 0.011 % + 8 μ V 0.037 % + 8 μ V 0.085 % + 25 μ V 0.34 % + 80 μ V	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 μ V 0.016 % + 25 μ V 75 μ V/V + 6 μ V 0.012 % + 16 μ V 0.025 % + 70 μ V 0.22 % + 850 μ V	
(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 μ V/V + 0.06 mV 0.012 % + 0.16 mV 0.025 % + 0.35 mV 0.34 % + 8.5 mV	
(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 0.27 % + 190 mV	
(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

Parameter/Range	Frequency	CMC ^{2, 4, 5, 7} (\pm)	Comments
AC Voltage (cont.) – Measure ³			
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	HP 3458A, synchronous sub- sampled mode
(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 (20 to 50) kHz (50 to 100) kHz	0.05 % + 40 mV 0.05 % + 20 mV 0.07 % + 20 mV 0.14 % + 20 mV 0.35 % + 20 mV	
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	40 Hz to 1 kHz	0.09 % 0.024 % 0.026 % 0.093 %	Fluke 5700A w/option 03
AC Current – Measure ³			
Up to 100 μ A	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz	0.46 % + 0.03 μ A 0.18 % + 0.03 μ A 0.078 % + 0.03 μ A	HP 3458A
100 μ A to 100 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 20 μ A 0.17 % + 20 μ A 0.073 % + 20 μ A 0.042 % + 20 μ A	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 200 μ A 0.19 % + 200 μ A 0.10 % + 200 μ A 0.12 % + 200 μ A	

Peter Blayze

Parameter/Range	Frequency	CMC ^{2, 4, 7} (±)	Comments
AC Current (cont.) – Measure ³ (1 to 500) A	(50 to 70) Hz	1.3 %	Fluke 5500 with Fluke coil

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 7} (±)	Comments
RF Tuned Power, Relative ³ – Measure (-0.0 to -3) dB (-3 to -10) dB (-10 to -40) dB (-40 to -50) dB (-50 to -80) dB (-80 to -90) dB (-90 to -110) dB (-110 to -127) dB	2.5 MHz (18 to 26.5)	0.06 dB 0.08 dB 0.11 dB 0.14 dB 0.20 dB 0.31 dB 0.34 dB 0.40 dB	HP 8902A, HP 11793A, 83650L
RF Power ³ , Absolute RF – Measure (-70 to +20) dBm (-30 to +20) dBm (-30 to +20) dBm	(50 MHz to 18 GHz) (50 MHz to 26.5 GHz) (100 kHz to 4.2 GHz)	0.66 dBm 0.66 dBm 0.60 dBm	HP 437B w/8484A, 8481A , w/8485A w/8482A
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	4.0 % 4.6 % 3.6 % 4.6 %	HP 8902A

Peter Abney

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
Frequency Modulation – Measure ³			
Rate: 250 kHz to 10 MHz Dev: ≤ 40 kHz	50 Hz to 10 kHz	3.1%	HP 8902A
Rate: 10 MHz to 1.3 GHz Dev: ≤ 400 kHz	50 Hz to 100 kHz 20 Hz to 200 kHz	1.6 % 7.7 %	
Phase Modulation – Measure ³			
Rate: 10 MHz to 1.3 GHz	200 Hz to 20 kHz	7 %	HP 8902A

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Pressure ³ – Measure	(-14 to 100) psig (100 to 1000) psig (1000 to 10000) psig	0.07 % 0.07 % 0.15 %	King Neutronic, 3689A
Torque ³	(40 to 400) in·oz (5 to 50) in·lb (15 to 150) in·lb (40 to 400) in·lb (25 to 250) ft·lb (250 to 1000) ft·lb	0.70 % 0.69 % 0.69 % 0.69 % 0.77 % 0.78 %	CDI torque system
Precision Balances ³	Up to 5000 g	1.0 LSD	Class 1 weights, LSD = least significant digit
Industrial Balances ³	Up to 10 000 g	1.0 LSD	Class F weights LSD = least significant digit
Scales ³	Up to 1000 lb	1.0 LSD	Class F weights LSD = least significant digit

V. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Humidity – Measuring Equipment ³ , Fixed Values	11 % RH 33 % RH 75.4 % RH 97 % RH	1.6 % of rdg 1.7 % of rdg 1.5 % of rdg 2 % of rdg	Saturated salt solutions
Temperature – Measuring Equipment	(-20 to 300) °C	0.33 °C	BMG 8163Q PRT and Fluke 9112 dry well calibrator

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. 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 3458A series of instruments. 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 In the statement of CMC, L is the numerical value of the nominal length 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.

Redmond, WA

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 15th day of April 2011.





Peter Meyer

President & CEO
For the Accreditation Council
Certificate Number 935.08
Valid to October 31, 2012

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