The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

MICRO PRECISION CALIBRATION DE MEXICO

Nuevo Leon, 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 23rd day of February 2010.

President & CEO
For the Accreditation Council
Certificate Number 0935.07
Valid to January 31, 2012

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

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

MICRO PRECISION CALIBRATION DE MEXICO
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CALIBRATION

Valid To: January 31, 2012 Certificate Number: 935.07

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Acoustical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Sound[3]	114 db SPL @ (125 to 2000) Hz 114 db SPL @ 4000 Hz	0.65 dB 0.75 dB	Genrad 1986 sound level calibrator

II. Chemical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Conductivity[3] – Measure	(84 to 445) µS (3900 to 7000) µS	0.5 µS 0.5 µS	Comparison to standard solutions
pH[3] – Measure	(4, 7, 10) pH units	0.02 pH units	Standard solutions

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III. Dimensional

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Calipers & Height Gages[3]	(0.10 to 24) in	(56 + 0.6*L*) µin	Mitutoyo gage blocks and length rods
Micrometers[3] –			
Resolution:			
100 µin	(0.10 to 12) in	(54 + 3*L*) µin	Mitutoyo gage blocks
50 µin		(28 + 2*L*) µin	
Surface Plates[3] –			
Repeatability (Flatness Only)	(12×12) in to (72×144) in	40 µin	Repeat-o-meter

IV. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
DC Voltage[3] – Generate	(0 to 330) mV	20 µV/V + 1 µV	Fluke 5520A
	330 mV to 3.3 V	11 µV/V + 2 µV	
	(3.3 to 33) V	12 µV/V + 20 µV	
	(33 to 330) V	18 µV/V + 150 µV	
	(330 to 1100) V	18 µV/V + 1500 µV	
DC Voltage[3] – Measure	(0 to 100) mV	13 µV/V + 3 µV	HP 3458A
	100 mV to 1V	17 µV/V + 0.3 µV	
	(1 to 10) V	13 µV/V + 0.5 µV	
	(10 to 100) V	15 µV/V + 30 µV	
	(100 to 1000) V	27 µV/V + 100 µV	
High Voltage	(1 to 20) kV	0.1 %	Vitrek 4600A

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
DC Current[3] – Generate	(0 to 330) µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 3 A (3 to 10) A (11 to 20.5) A	0.015 % + 20 nA 0.01 % + 50 nA 0.01 % + 0.25 µA 0.01 % + 2.5 µA 0.038 % + 40 µA 0.05 % + 500 µA 0.1 % + 750 µA	Fluke 5520A
DC Current[3] – Measure	Up to 100 nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 10 mA (10 to 100) mA 100 mA to 1 A (1 to 1000) A	35 µA/A + 400 µA 25 µA/A + 40 µA 25 µA/A + 10 µA 25 µA/A + 5 µA 25 µA/A + 5 µA 40 µA/A + 5 µA 0.012 % + 10 µA 0.55 %	HP 3458A Fluke 5520A with current coil
Resistance[3] – Generate	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ 100 MΩ to 1 GΩ	0.12 % + 0.008 Ω 0.17 % 0.018 % 0.024 % 0.009 % + 0.06 Ω 0.024 % 0.009 % + 0.6 Ω 0.012 % 0.011 % + 6 Ω 0.013 % 0.015 % + 55 Ω 0.019 % 0.016 % 0.041 % 0.058 % 0.37 % 1.8 % 0.58 %	Fluke 5520A HRRS-B decade resistance

Parameter/Equipment	Range	CMC[2, 4, 5, 7] (±)	Comments
Resistance[3] – Measure	(0 to 10) Ω (10 to 100) Ω 100 Ω to 100 kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	19 μΩ/Ω + 0.06 mΩ 13 μΩ/Ω + 0.6 mΩ 10 μΩ/Ω + 0.6 mΩ 15 μΩ/Ω + 2.4 Ω 59 μΩ/Ω + 120 Ω 0.058 % + 1.2 kΩ 1.8 % + 10 kΩ	HP 3458A
Electrical Calibration of Thermocouple Indicators[3] –			
Type E	-250 ºC to -100 ºC -100 ºC to 650 ºC 650 ºC to 1000 ºC	0.56 ºC 0.54 ºC 0.53 ºC	Fluke 5520A
Type J	-210 ºC to -100 ºC -100 ºC to 760 ºC 760 ºC to 1200 ºC	0.48 ºC 0.45 ºC 0.43 ºC	
Type K	-200 ºC to -100 ºC -100 ºC to 120 ºC 120 ºC to 1000 ºC 1000 ºC to 1372 ºC	0.48 ºC 0.44 ºC 0.46 ºC 0.47 ºC	
Type S	0 ºC to 250 ºC 250 ºC to 1400 ºC 1400 ºC to 1767 ºC	0.48 ºC 0.47 ºC 0.54 ºC	
Type T	-250 ºC to -150 ºC -150 ºC to 0 ºC 0 ºC to 400 ºC	0.56 ºC 0.52 ºC 0.58 ºC	
Electrical Calibration of RTDs[3] –			
Pt 385, 1 kΩ	-200 ºC to 100 ºC 100 ºC to 260 ºC 260 ºC to 600 ºC 600 ºC to 630 ºC	0.03 ºC 0.05 ºC 0.07 ºC 0.23 ºC	Fluke 5520A
PtNi 385, 100 Ω	-80 ºC to 100 ºC 100 ºC to 260 ºC	0.08 ºC 0.14 ºC	
Cu 427, 10 Ω	-100 ºC to 260 ºC	0.3 ºC	

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Inductance[3] – Generate, Fixed Points, @ 1 kHz	1.0 mH 50 mH 100 mH 1 H	0.054 % 0.065 % 0.059 % 0.075 %	Genrad 1482 series

Parameter/Range	Frequency	CMC[2, 4, 7] (±)	Comments
AC Voltage[3] – Generate			
(0 to 33) 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	80 µV/V + 6 µV 0.015 % + 6 µV 0.02 % + 6 µV 0.1 % + 6 µV 0.35 % + 12 µV 0.8 % + 50 µV	Fluke 5520A
(33 to 330) 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	0.03 % + 8 µV 0.015 % + 8 µV 0.016 % + 8 µV 0.035 % + 8 µV 0.08 % + 32 µV 0.2 % + 70 µV	
330 mV to 3.3 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	0.03 % + 50 µV 0.015 % + 60 µV 0.019 % + 60 µV 0.03 % + 50 µV 0.07 % + 130 µV 0.24 % + 600 µV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.03 % + 650 µV 0.015 % + 600 µV 0.024 % + 600 µV 0.035 % + 600 µV 0.09 % + 1.6 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.019 % + 2 mV 0.02 % + 6 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.09 % + 50 mV	
(330 to 1100) V	45 Hz to 10 kHz	0.03 % + 10 mV	

Parameter/Range	Frequency	CMC[2, 4, 5, 7] (±)	Comments
AC Voltage[3] – Measure			
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 µV 0.02 % + 2 µV 0.03 % + 2 µV 0.12 % + 2 µV 0.58 % + 2 µV 4.6 % + 2 µV	HP 3458A
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 µV/V + 0.4 mV 80 µV/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 (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	
(1 to 15) kV	Up to 1 kHz	1 %	Vitrek 4600A
AC Current[3] – Generate			
(1 to 220) µA 220 µA 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 5520A
(1 to 1000) A	60 Hz	0.54 %	Fluke 5520A w/ current coil

Parameter/Range	Frequency	CMC[2, 4, 5, 7] (±)	Comments
AC Current[3] – Measure			
Up to 100 µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz	0.46 % + 0.03 µA 0.18 % + 0.03 µA 0.078 % + 0.03 µA	HP 3458A
100 µA to 100 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 20 µA 0.17 % + 20 µA 0.073 % + 20 µA 0.042 % + 20 µA	
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 µA 0.19 % + 200 µA 0.1 % + 200 µA 0.12 % + 200 µA	
Capacitance[3] – Generate			
(0.19 to 3.3) nF (3.3 to 330) nF 330 nF to 3.3 µF (3.3 to 33) µF (33 to 330) µF	50 Hz to 1 kHz	0.5 % + 0.01 nF 0.25 % + 0.3 nF 0.25 % + 3 nF 0.4 % + 30 nF 0.45 % + 0.3 µF	Fluke 5520A
330 µF to 3.3 mF (3.3 to 33) mF (33 to 110) mF	50 Hz to 300 Hz	0.45 % + 3 µF 0.75 % + 30 µF 1.1 % + 100 µF	
Oscilloscopes[3] –			
Level Sine Amp 50 kHz Ref.	5 $mV_{(p-p)}$ to 5 $V_{(p-p)}$	2 % + 300 µV	Fluke 5520A/SC600
Level Sine Flatness 5 mV to 5.5 V Relative to 50 kHz Reference	 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	 3.5 % + 300 µV 4 % + 300 µV 6 % + 300 µV	
Square Wave 1 MΩ, 100 Hz 50 Ω, 1 kHz	 1 mV to ± 130 V ± 1 mV to ± 6.6 V	 1.2 % + 40 µV 0.25 % + 40 µV	
Time Marker Output Into 50 Ω	2 ns to 20 ms 50 ms to 5 s	(25 + 1000*t*) µs/s 25 µs/s	*t* is the time in seconds

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Oscilloscopes[3] – (cont) Pulse Rise Time 0.5 V, 1 $V_{(p-p)}$ 1 $V_{(p-p)}$	 10 MHz 1 MHz	 100 ps 100 ps	 Fluke 5520A/SC600

V. Electrical – RF & Microwave

Parameter/Range	Frequency	CMC[2, 7] (±)	Comments
RF Tuned Power[3] – Generate, Connector Type N (0 to -100) dB	 Up to 1.3 GHz Up to 18 GHz	 0.40 dB 0.72 dB	 HP 8902A w/ HP11722A
RF Absolute Power[3] – Generate, Connector Type N 50 MHz to 18 GHz	 (-30 to -20) dB (-20 to 10) dB (10 to 20) dB	 0.06 dB 0.068 dB 1.2 dB	 HP 437B w/ 8484A 8482A 8481A
Amplitude Modulation[3] – Measure 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 100 kHz 50 Hz to 50 kHz 20 Hz to 100 kHz	 4.0 % 4.6 % 3.6 % 4.6 %	 HP 8902A
Frequency Modulation[3] – Measure Rate: 250 kHz to 10 MHz Dev: ≤ 40 kHz Rate: 10 MHz to 1.3 GHz Dev: ≤ 400 kHz	 20 Hz to 10 kHz 20 Hz to 200 kHz 50 Hz to 100 kHz	 3.1 % 7.7 % 1.6 %	 HP 8902A

Parameter/Range	Frequency	CMC[2, 5, 7] (±)	Comments
Phase Modulation[3] – Measure Rate: 10 MHz to 1.3 GHz	200 Hz to 20 kHz	7.0 %	HP 8902A

VI. Fluid Quantities

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Viscosity[3]	(1061 to 200 000) cP	0.52 %	Cannon viscosity standards

VII. Mechanical

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Indirect Verification of Rockwell Hardness and Rockwell Superficial Hardness Testers[3]	HRC: 23.67 HRC 52.78 HRC HR15N: 69.67 HR15N 85.25 HR15N HR15T: 73.34 HR15T 88.14 HR15T HRB: 49.15 HRB	 1.0 HRC 1.0 HRC 1.0 HR15N 1.0 HR15N 1.0 HR15T 1.0 HR15T 1.5 HRB	ASTM E18-05
Force[3] – Tension and Compression	Up to 10 000 lbf	0.53 %	Load cells

Parameter/Equipment	Range	CMC[2, 4, 7] (±)	Comments
Pressure[3]	(-15 to 30) psi Up to 1000 psi Up to 10 000 psi	0.1 % 0.09 % 0.1 %	Fluke 725, 700PD5, 700P08, 700P31
Torque[3]	(16 to 160) in·oz (0 to 100) in·lb (50 to 500) ft·lb	0.77 % 0.65 % 0.71 %	Mountz torque system
Photo Tachometer[3]	(1 to 5000) RPM (5000 to 100 000) RPM	1 RPM 0.05% of rdg + 1 RPM	Fluke 5520A with LED and series resistor
Mass	Up to 500 mg Up to 500 g (0.5 to 24) oz (2 to 4) oz (0.5 to 32) lb Up to 1200 lb	0.15 % 0.19 % 0.035 oz 0.35 oz 0.31 lb 0.3 %	Double substitution NIST Handbook 44 using Class 1 weights NIST Handbook 44 using Class F weights

VIII. Optical Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Illuminance	(10 to 1000) fc	1.7 % of rdg + 2 LSD	Standard light meter
Optical Comparators and Visual Systems[3]	Up to 200 mm	210 µm	Glass scale and gage blocks

IX. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Humidity Measuring Equipment[3] – Fixed Points	11 % RH 33 % RH 75.4 % RH 97 % RH	1.6 % RH 1.7 % RH 1.5 % RH 2 % RH	Standard salt solutions
Temperature[3] – Measuring Equipment	0 ºC to 300 ºC	0.33 ºC	Hart 9100
Temperature[3] – Measure	-20 ºC to 200 °C	1 °C	DP 97
Infrared Thermometers[3]	(10 to 400) °C	1.5 °C	Black body 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 5520A instrument. 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.

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