THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

J. H. METROLOGY CO., INC.

Rolling Meadows, IL

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 18 June 2005*).

Presented this 19th day of October 2007.

President
For the Accreditation Council
Certificate Number: 1618.01
Valid to: May 31, 2009
Revised: April 27, 2009

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

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CALIBRATION

Valid To: May 31, 2009 Certificate Number: 1618.01

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

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	Best Uncertainty[2, 3, 4](±)	Comments
DC Voltage – Generate	(0 to 10) V	2 μV/V + 0.5 μV	Fluke 732A/Fluke 720A Kelvin-Varley divider
	10 V to 1 kV	9 μV/V + 400 μV	Fluke 732A/752A/5720A
	(1 to 30) kV	0.066 % of IV + 5 μV	Hallmark PVD kilovolt divider, Fluke 885AB
DC Voltage – Measure	(0 to 10) V	2 μV/V + 0.5 μV	Fluke 732A/Fluke 720A Kelvin-Varley divider
	10 V to 1 kV	9 μV/V + 400 μV	Fluke 732A/752A/5720A
	(1 to 30) kV	0.046 % of IV + 5 μV	Hallmark PVD kilovolt divider, Fluke 885AB
DC Current – Measure	10 μA to 10 A	42 parts in 10^6	L&N 4000 series standard resistors, Biddle Cat. #601235 standard resistor and Fluke 8508A

Parameter/Equipment	Range	Best Uncertainty[2, 3, 4] (±)	Comments
DC Current – Measure (cont)	(10 to 15) A (15 to 100) A (100 to 300) A	0.012 % of IV 0.04 % of IV 0.045 % of IV	Fluke 8508A with L&N 4360 and 4361 shunt L&N 4363 shunt
DC Current – Generate	10 μA to 10 A (10 to 15) A (15 to 100) A (100 to 500) A	42 parts in 10^6 0.012 % of IV 0.042 % of IV 1.1 % of IV + 0.05 A	L&N 4000 series standard resistor, L&N 4360 shunt, Fluke 8508A, and Fluke 5520A Fluke 8508A, Fluke 5720A, Ballantine 1620A and L&N 4361 shunt Fluke 5500A with coil
Resistance – Measure	(0.1 to 10) Ω 10 Ω to 1 kΩ (1 to 100) kΩ 100 kΩ to 100 MΩ 0.01 Ω 0.001 Ω Shunts 0.001 Ω and below	92 parts in 10^6 36 parts in 10^6 24 parts in 10^6 56 parts in 10^6 0.012 % of IV 0.016 % of IV 0.058 % of IV	ESI SR1010 standard resistors, General Radio 1666 Fluke 8508A low ohms bridge, ratio divider box and Guildline type 1659 standard resistor Fluke 8508A low ohms bridge and ratio divider box
Resistance – Generate	(0.1 to 100) Ω 10 Ω to 1 kΩ (1 to 100) kΩ 100 kΩ to 100 MΩ 0.01 Ω	76 parts in 10^6 39 parts in 10^6 39 parts in 10^6 40 parts in 10^6 17 parts in 10^6	ESI SR 1010 standard resistors ESI SR 1050 standard resistors Biddle Cat. #601235 standard resistor

Parameter/Equipment	Range	Best Uncertainty[2, 3, 4] (±)	Comments
Resistance – Generate (cont)	0.001 Ω	0.014 % of IV	Guildline type 1659 standard resistor
	0.0001 Ω	0.016 % of IV	L&N 4334B standard resistor
Capacitance – Measure @ 1 kHz	(10, 100, 1000) pF	18 parts in 10^6	General Radio 1615-A, General Radio 1404 series and ESI SC 1000 standard capacitors
	1 pF to 1 μF	0.012 % of IV	General Radio 1615-A
Capacitance – Generate @ 1 kHz	(10, 100, 1000) pF	18 parts in 10^6	General Radio 1404 series and ESI SC 1000 standard capacitors
	1 pF to 1 μF	0.053 % of IV + 0.7 pF	General Radio 1413 decade capacitor
Inductance – Generate @ 1 kHz	100 μH to 10 H	0.025 % of IV	General Radio 1482 series standard inductors
Inductance – Measure @ 1 kHz	100 μH to 10 H	0.029 % of IV	General Radio 1482 standard inductor and ESI DT 72A
Electrical Calibration of Thermocouple Indicators –			Fluke 5720A, Hart Scientific 9101 ice point and ice point probe
Type E	-200 °C to 1000 °C	0.18 °C	
Type J	-200 °C to 1200 °C	0.18 °C	
Type K	-200 °C to 1372 °C	0.18 °C	
Type T	-250 °C to 400°C	0.18 °C	

Parameter/Equipment	Range	Best Uncertainty[2, 3] (±)	Comments
Electrical Calibration of RTD Indicators –			Decade resistors and standard resistors ESI RS925A, General Radio 1433T, ESI SR 1010
Pt 385, 100Ω	-200 °C to 800 °C	0.03 °C	
Pt 385, 200 Ω	-190 °C to 630 °C	0.03 °C	
Pt 385, 500 Ω	-190 °C to 630 °C	0.03 °C	
Pt 385, 1 kΩ	-190 °C to 630 °C	0.03 °C	
PtNi 385, 120 Ω	-80 °C to 260 °C	0.03 °C	
Pt 3916, 100 Ω	-200 °C to 630 °C	0.03 °C	
Pt 3926, 100 Ω	-200 °C to 630 °C	0.03 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.03 °C	

Parameter/Range	Frequency	Best Uncertainty[2, 3, 4] (±)	Comments
AC Current – Measure			
(2.5 to 5) mA	5 Hz to 20 kHz	0.016 % of IV	Fluke 792A, 5720A, 8508A, A-40 shunts and L&N 4000 series standard resistors
(5 to 20) mA	5 Hz to 20 kHz	0.016 % of IV	
(20 to 300) mA	5 Hz to 20 kHz	0.016 % of IV	
300 mA to 2 A	5 Hz to 20 kHz	0.016 % of IV	
(2 to 10) A	5 Hz to 20 kHz	0.014 % of IV	Fluke 792A, A-40 shunts, 5720A, 8508A, and Biddle Cat. #601235 standard resistor
AC Current – Generate			
(2.5 to 5) mA	10 Hz to 20 kHz	0.016 % of IV	Fluke 792A, 5520A, 5720A, 8508A, and L&N 4000 series standard resistor
(5 to 20) mA	10 Hz to 20 kHz	0.016 % of IV	
(20 to 300) mA	10 Hz to 20 kHz	0.016 % of IV	Fluke 792A, 5520A, 5720A, 8508A, A-40 shunts, and L&N 4000 series standard resistors

Parameter and Range	Frequency	Best Uncertainty[2, 3, 4] (±)	Comments
AC Current – Generate (cont)			Fluke 792A, 5520A, 5720A, 8508A, A-40 shunts, and L&N 4000 series standard resistors
300 mA to 2 A	10 Hz to 10 kHz	0.016 % of IV	
(2 to 10) A	45 Hz to 5 kHz	0.014 % of IV	
(10 to 100) A	45 Hz to 1 kHz	0.26 % of IV	Ballantine 1620A, Fluke 5200A
AC Voltage – Measure			
(0.5 to 500) V	5 Hz to 1 MHz	67 parts in 10^6	Fluke 792A, 5720A
(0.5 to 50) V	(50 to 100) kHz	67 parts in 10^6	
(20 to 50) V	(100 to 500) kHz	67 parts in 10^6	
(0.5 to 10) V	100 kHz to 1 MHz	67 parts in 10^6	
(100 to 500) V	(50 to 100) kHz	67 parts in 10^6	
1000 V	5 Hz to 50 kHz	67 parts in 10^6	
(1 to 30) kV	60 Hz	0.52 % of IV	Hallmark PVD kilovolt divider and Fluke 931B
AC Voltage – Generate			
(0.5 to 10) V	10 Hz to 1 MHz	76 parts in 10^6	Fluke 792A, 5200A, 5720A
(10 to 100) V	10 Hz to 100 kHz	76 parts in 10^6	
(100 to 1000) V	10 Hz to 50 kHz	78 parts in 10^6	Fluke 792A, 5200A w/5205A, 5720A
(1 to 6) kV	60 Hz	0.26 % of IV	Fluke 5200A and Weston 311 type 2

II. Electrical – RF/Microwave

Parameter/Equipment	Frequency	Best Uncertainty[2, 3, 4] (±)	Comments
RF Power	(10 to 100) MHz	0.52 % of IV	HP 478A-H75 and HP 34401A

III. Time and Frequency

Parameter/Equipment	Frequency	Best Uncertainty[2, 3] (±)	Comments
Frequency –			
Generate	(0.1, 1, 5, 10) MHz	1 part in 10^{11}	WWVB and NBS receiver
Measure	DC to 18 GHz	1 part in 10^{9}	Rubidium and quartz oscillators

IV. Dimensional

Parameter/Equipment	Range	Best Uncertainty[2, 3] (±)	Comments
Micrometers	(0 to 1) in (1 to 2) in (2 to 3) in (3 to 4) in (4 to 5) in (5 to 6) in (6 to 7) in (7 to 8) in (8 to 10) in (10 to 12) in (12 to 20) in	34 µin 48 µin 67 µin 88 µin 130 µin 150 µin 170 µin 190 µin 220 µin 270 µin 390 µin	Gage blocks
Calipers	(0 to 40) in	190 µin	Caliper checker
Height Gages	(0 to 36) in	130 µin	Caliper checker

Parameter/Equipment	Range	Best Uncertainty[2, 3] (±)	Comments
Depth Gages	(0 to 1) in (0 to 2) in (0 to 3) in (0 to 4) in (0 to 5) in (0 to 6) in (0 to 7) in (0 to 8) in (0 to 10) in (0 to 12) in	61 µin 69 µin 69 µin 86 µin 110 µin 110 µin 110 µin 110 µin 110 µin 210 µin	Gage blocks
Dial and Test Indicators	(0 to 1) in (0 to 2) in (0 to 3) in (0 to 4) in	17 µin 38 µin 63 µin 91 µin	Gage blocks
Cylindrical OD	(0 to 1) in (0 to 2) in (0 to 3) in (0 to 4) in (0 to 5) in (0 to 6) in (0 to 7) in (0 to 8) in (0 to 10) in	21 µin 36 µin 52 µin 68 µin 83 µin 100 µin 120 µin 140 µin 170 µin	Gage blocks and supermicrometer
Cylindrical OD (Pin Sets)	(0 to 1) in	42 µin	Laser micrometer
Outside Threads	(0 to 1) in (0 to 2) in (0 to 3) in (0 to 4) in (0 to 5) in (0 to 6) in	32 µin 39 µin 57 µin 72 µin 87 µin 110 µin	Gage blocks, thread wires, and supermicrometer

V. Mechanical

Parameter/Equipment	Range	Best Uncertainty[2, 3, 4] (±)	Comments
Pressure Measuring Equipment			
Vacuum	(-15 to 0) psi	0.032 % of FS	PTE-1, pressure calibrator
	(0 to 15) psi	0.032 % of FS	
	(0 to 100) psi	0.032 % of FS	
	(100 to 300) psi	0.032 % of FS	Deadweight tester
	(0 to 1000) psi	0.10 % of IV	
	(1000 to 10 000) psi	0.10 % of IV	
Torque – Measure	(0 to 2000) ft·lb	0.25 % of IV	CDI Torque calibrator
Scales, Balances and Force			
(0 to 6.7) kg	1 g	0.54 mg	Class 2 weights
	10 g	0.075 mg	
	20 g	0.11 mg	
	30 g	0.48 mg	
	50 g	0.26 mg	
	100 g	0.52 mg	
	200 g	1.1 mg	
	300 g	1.6 mg	
	500 g	2.6 mg	
	1000 g	5.2 mg	
	1.5 kg	5.3 mg	
	3.0 kg	16 mg	
	6.7 kg	19 mg	
(0 to 250) lb	1 lb	74 mg	Class F weights
	2 lb	140 mg	
	5 lb	210 mg	
	10 lb	310 mg	
	20 lb	510 mg	
	50 lb	2 g	
	250 lb	6.8 g	

VI. Thermodynamics

Parameter/Equipment	Range	Best Uncertainty[2, 3] (±)	Comments
Temperature – Measuring Equipment and Measure	-30 °C to 100 °C	0.044 °C	Minco S7929PA 1L120S RTD probe with Minco RTB 8078 resistance thermometer bridge and fluid bath
	30°C to 500 °C	0.58 °C	Minco S7929PA 1L120S RTD probe with Jofra 600S, dry well, and Minco RTB 8078 resistance thermometer bridge
Relative Humidity – Measure	10 % RH to 80 % RH	1.4 % RH	Vaisala HMI 41 w/ HMP 46

[1] This laboratory offers commercial calibration service and on-site calibration service.

[2] "Best Uncertainty" 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 of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer's device, to the environment and to influences from the circumstances of the specific calibration.

[3] The uncertainties achievable on a customer's site can normally be expected to be larger than the Best Measurement Capabilities (BMC) that the accredited laboratory has been assigned as Best Uncertainty 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 uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the calibration uncertainty being larger than the BMC.

[4] In the statement of best uncertainty, IV represents indicated value and FS represents full scale.