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

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CALIBRATION

Valid To: September 30, 2010 Certificate Number: 1395.19

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] (±)	Comments
DC Voltage[3] – Generate	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	23 µV/V + 1 µV 8.2 µV/V + 10 µV 4.3 µV/V + 100 µV 24 µV/V + 1.1 mV 11 µV/V + 6 mV	Fluke 5520A/SC1000
DC Current3 – Generate	(0 to 330) µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1to 11) A (11 to 20) A	23 µA/A + 2 nA 19 µA/A + 20 nA 19 µA/A + 20 0nA 19 µA/A + 2 µA 51 µA/A + 20 µA 140 µA/A + 200 µA 920 µA/A + 200 µA	Fluke 5520A/SC1000 [1] Floor specification doubled after 30 seconds

Parameter/Equipment	Range	Best uncertainty[2, 5] (±)	Comments
DC Current[3] – Measure	(0 to 1) µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	160 µA/A + 100 parts in 10^6 21 µA/A + 10 parts in 10^6 14 µA/A + 1 parts in 10^6 6 µA/A + 1 parts in 10^6 16 µA/A + 1 parts in 10^6 17 µA/A + 1 parts in 10^6 110 µA/A + 1 parts in 10^6	HP 3458A
Resistance[3] – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 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 (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (0.11 to 1.1) GΩ	66 µΩ/Ω + 1 µΩ 27 µΩ/Ω + 1.5 mΩ 14 µΩ/Ω + 1.4 mΩ 18 µΩ/Ω + 2 mΩ 13 µΩ/Ω + 2 mΩ 14 µΩ/Ω + 20 mΩ 13 µΩ/Ω + 20 mΩ 17 µΩ/Ω + 200 mΩ 13 µΩ/Ω + 200 mΩ 38 µΩ/Ω + 2 Ω 18 µΩ/Ω + 2 Ω 73 µΩ/Ω + 30 Ω 35 µΩ/Ω + 50 Ω 200 µΩ/Ω + 2.5 kΩ 170 µΩ/Ω + 3 kΩ 2.2 mΩ/Ω + 500 kΩ	Fluke 5520A/SC1000 Best uncertainties shown are based on 4 wire compensation only; for 2 wire and 2 wire compensation add 5 µV per Amp stimulus current. (R_{floor} = E/I)
Resistance[3] – Measure	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ (10 to 100 MΩ (100 to 1000 MΩ	14 µΩ/Ω + 0.5 µΩ 14 µΩ/Ω + 0.5 µΩ 5.2 µΩ/Ω + 1 µΩ 5.1 µΩ/Ω + 10 µΩ 5.1 µΩ/Ω + 10 µΩ 13 µΩ/Ω + 10 µΩ 14 µΩ/Ω + 10 µΩ 35 µΩ/Ω + 100µΩ 1.9 mΩ/Ω + 1.2 mΩ	HP 3458A, within ± 1 °C of last ACAL and ± 5 °C of T_{CAL}.
Phase Angle[3] – Generate 0.5 V / 3 V 65 Hz 400 Hz 1 kHz 10 kHz 30 kHz 1 kHz	 0.0 ° 0.0 ° 0.0 ° 0.0 ° 0.0 ° 60 °, 90 °	 0.1° 0.3° 0.6° 6° 10° 0.7°	Fluke 5520A/SC1000

Parameter/Equipment	Range	Best uncertainty[2, 5] (±)	Comments
Phase Angle[3] – Generate			
3 V / 1 A / 65 Hz	0.0 °	0.1°	Fluke 5520A/SC1000
3 V / 5 A / 400 Hz	0.0 °, 60 °, 90 °	0.3°	
Oscilloscopes[3] –			
Level Sine Amp –			
50 kHz reference	10 mV to 5.0 V (p-p)	3.6 % + 100µV	Fluke 5520A/SC1000
Level Sine Flatness – Generate			
5 mV to 5.5 V relative to 50 kHz ref.	50 kHz to 100 MHz (100 to 300) MHz (300 to 1000) MHz	1.2 % + 300µV	
Square Wave – Generate			
1 MΩ, 100 Hz	(0.1, 1, 10) V	2.6 % + 100µV	
50 Ω, 1 kHz	(0.1, 1, 10) V	2.6 % + 100µV	
Time Marker Output into 50 Ω	2 ns to 20 ms 50 ms to 5 s	2.5 µs/s (25 + 1000*t) µs/s	t = time in seconds
Pulse Rise Time –			
0.5 V, 1 V (p-p) 1 V (p-p)	10 MHz 1 MHz	(+0 / -100) ps (+0 / -100) ps	
Electrical Simulation of Thermocouples[3] – Generate			
Type E	-125 °C to 400 °C	0.17 °C	Fluke 5520A
Type J	-125 °C to 400 °C	0.16 °C	
Type K	-125 °C to 400 °C	0.18 °C	
Type T	-125 °C to 400 °C	0.21 °C	

Parameter/Range	Frequency	Best uncertainty[2, 5] (±)	Comments
AC Voltage[3] – Generate			
(1 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	0.028 % + 6 µV 0.027 % + 6µV 0.027 % + 6 µV 0.087 % + 6µV 2.93 mV/V + 12µV 7.10 mV/V + 50 µV	Fluke 5520A/SC1000
(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	0.015 % + 8µV 0.014 % + 8 µV 0.015 % + 8 µV 0.028 % + 8 µV 0.068 % + 32 µV 1.6 mV/V + 70 µV	
(0.33 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	0.014 % + 8µV 0.014 % + 8 µV 0.018 % + 8 µV 0.024 % + 8 µV 0.055 % + 32 µV 1.9 mV/V + 70 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	0.013 % + 650 µV 0.013 % + 600 µV 0.020 % + 600 µV 0.029 % + 600 µV 0.070 % + 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	0.015 % + 2mV 0.017 % + 6 mV 0.021 % + 6 mV 0.024 % + 6 mV 1.1 mV/V + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.054 % + 10 mV 0.054 % + 10 mV 0.050 % + 10 mV	

Parameter/Range	Frequency	Best uncertainty[2, 4, 5] (±)	Comments
AC Voltage[3] – Measure			
(1 to 10) mV	(1 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1 MHz	72 µV/V + 3 µV 51 µV/V + 1.1µV 58 µV/V + 1.1µV 83 µV/V + 1.1 µV 0.03 % +1.1 µV	HP 3458A
(10 to 100) mV	(1 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1MHz	71 µV/V + 3 µV 51 µV/V + 1.1µV 58 µV/V + 1.1µV 85 µV/V + 1.1 µV 0.03 % + 1.1µV	
100 mV to 1 V	(1 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1MHz	47 µV/V + 40 µV 49 µV/V + 20 µV 40 µV/V + 20 µV 39 µV/V + 20 µV 0.03 % + 100 µV	
(1 to 10) V	(1 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1 MHz	43 µV/V + 400 µV 43 µv/V + 200 µV 61 µV/V + 200 µV 90 µV/V + 200 µV 0.027 % + 1 mV	
(10 to 100) V	(1 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1MHz	56 µV/V + 4mV 56 µV/V + 2 mV 75 µV/V + 2mV 0.011 % + 2 mV 2.4 mV/V + 10 mV	
(100 to 1000) V	(1 to 45) Hz 45 Hz to 1 kHz (1 to 30) kHz (30 to 100) kHz	0.06 % + 40 mV 0.057 % + 20 mV 0.067 % + 20 mV 1.3 mV/V + 20 mV	
AC Current[3] – Generate @ 1kHz	(30 to 330) µA 330 µA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11A to 20.5) A	2.1 mA/A + 0.1 µA 1.5 mA/A + 0.15 µA 0.044 % + 2 µA 0.071 % + 20 µA 0.027 % + 100 µA 0.057 % + 100 µA 0.055 % + 2 mA 1.6 mA/A + 5 mA	Fluke 5520A/SC1000; LCOMP off

Parameter/Range	Frequency	Best uncertainty[2, 4, 5] (±)	Comments
AC Current[3] – Measure @ 1 kHz	(5 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.027 % + 0.03 µA 0.021 % + 0.2 µA 0.012 % + 2 µA 0.012 % + 20 µA 0.012 % + 0.2 mA	HP 3458A

III. Time & Frequency

Parameter/Equipment	Range	Best uncertainty[2] (±)	Comments
Frequency[3] – Measure	10 Hz to 26.5 GHz	1.2×10^{-7}	HP5342A

IV. Electrical – Microwave & RF

Parameter/Equipment	Range	Best uncertainty[2] (±)	Comments
RF Power – Generate			
(+13 to -80) dBm	200 Hz to 80 MHz	0.26 dBm	HP 3335A
(+10 to -100) dBm	10 MHz to 20 GHz (20 to 26.5) GHz	4.3 dB 4.9 dB	HP 8340A (Bands 0-3) HP 8340A (Band 4)
Absolute RF Power – Measure			
0 dBm	50 MHz	2 %	EL 1300 Thermal Converter
(+15 to -20) dBm	100 kHz to 18 GHz	3.1 %	HP 8902A w/11722A power sensors
(-20 to -70) dBm	100 kHz to 18 GHz	3.5 %	HP 437B 8482A, 8485A, 8484A

Parameter/Equipment	Range	Best uncertainty[2, 5] (±)	Comments
Tuned RF Power, Relative[3] – Measure			
0 dB, Reference (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 to 18 GHz	Reference 0.13 dB 0.13 dB 0.16 dB 0.18 dB 0.24 dB 0.26 dB 0.3 dB 0.4 dB	HP 8902A, 11793A w/ 11722A, 11792
Amplitude Modulation[3] – Measure			
(0.02 to 1300) MHz	Rate: 20 Hz to10 kHz, Depths up to 99 % Rate: 20 Hz to 100 kHz, Depths up To 99 %	2.9 %*D* 2.9 %*D*	HP 8902A *D* = depth of modulation
Frequency Modulation – Measure[3]			
(0.15 to 1300) MHz	Rate: 50 Hz to 100 kHz, Deviations <= 400 kHz Rate: 10 Hz to 200 kHz, Deviations <= 400 kHz	1.2 % + 1 digit 5.8 % + 1 digit	HP 8902A
Frequency – Generate	(0.01 to 26.5) GHz	2.2 parts in 10^{-7}	HP 3335C Fluke 6061 HP 8340A

[1] This laboratory offers commercial calibration service and field 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] 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 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] Based on µsing the standard at the temperatµre the HP 3458A was calibrated (tcal ± 5°C) and an aµto-calibration (ACAL) was performed within the previoµs 24 hoµrs (± 1°C of ambient temperatµre) more than 5°C. For resistance, a zero calibration is performed at least every 12 hoµrs within ± 1°C of µse.

[5] In the statement of best uncertainty, the value is defined as the percentage of reading unless otherwise noted.

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

SIMCO ELECTRONICS DE MEXICO S.A DE C.V.

Tijuana, 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 18 June 2005*).

Presented this 14th day of May 2008.

President
For the Accreditation Council
Certificate Number 1395.19
Valid to September 30, 2010
Revised August 23, 2010

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