



SCOPE OF ACCREDITATION TO ISO 17025:2005

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CALIBRATION

Valid To: February 29, 2016

Certificate Number: 2357.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Oscilloscopes ³ –			
DC Voltage – Generate 50 Ω, 1 MΩ load	0 V (0 to 100) mV 100 mV to 1.0 V (1.0 to 5.56) V	15 μV 0.050 % + 26 μV 0.022 % + 65 μV 0.026 % + 50 μV	Wavetek 9500, Fluke 9500B
1 MΩ load	(5.6 to 222.4) V	0.030 %	
DC Voltage – Measure	(0 to 5) V	0.11 % + 3.0 mV	Keithley 2000
Resistance – Measure	50 Ω	0.13 %	Wavetek 9500, Fluke 9500B
	75 Ω	0.18 %	Wavetek/Fluke 9530
	1 MΩ	0.12 %	
AC Voltage – Generate, Sinewave, (V _{p-p})			
50 Ω			
4.4 mV to 5.6 V	1 Hz to 550 MHz	0.033 V/V	Wavetek 9500,
4.4 mV to 3.4 V	550 MHz to 2.5 GHz	0.063 V/V	Fluke 9500B,
4.4 mV to 2.2 V	(2.5 to 3.2) GHz	0.11 V/V	Wavetek/Fluke 9530 1 Hz to 3.2 GHz

Parameter/Equipment	Range	CMC ² (±)	Comments
Oscilloscope (cont) – Sinewave Flatness – Generate 50 Ω Load, 50 KHz to 10 MHz Reference, V _{p-p} 4.4 mV to 5.6 V 4.4 mV to 5.6 V 4.4 mV to 3.4 V 4.4 mV to 3.4 V 4.4 mV to 2.2 V	1 Hz to 100 MHz (100 to 550) MHz 550 MHz to 1.1 GHz (1.1 to 2.5) GHz (2.5 to 3.2) GHz	0.22 dB 0.27 dB 0.37 dB 0.47 dB 0.48 dB	Wavetek 9500, Fluke 9500B Wavetek/Fluke 9530 1 Hz to 3.2 GHz
DC Current ³ – Measure	(0 to 100) nA 100 nA to 1 μA (1 to 10) μA (10 to 100) μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	3.3 % + 50 pA 0.33 % + 10 pA 0.030 % + 30 pA 40 μA/A + 0.80 nA 40 μA/A + 5.0 nA 40 μA/A + 50 nA 50 μA/A + 0.60 μA 0.010 % + 10 μA	HP 3458A
DC Resistance ³ – Measure	(0.1 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ	20 μΩ/Ω + 0.060 mΩ 10 μΩ/Ω + 0.60 mΩ 10 μΩ/Ω + 0.60 mΩ 10 μΩ/Ω + 5.6 mΩ 10 μΩ/Ω + 0.070 Ω 20 μΩ/Ω + 2.3 Ω 60 μΩ/Ω + 120 Ω 0.060 % + 1.1 kΩ	HP 3458A
DC Voltage – Measure	(0 to 0.1) V (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1100) V	5.0 μV/V + 0.70 μV 6.0 μV/V + 0.30 μV 4.0 μV/V + 10 μV 7.0 μV/V + 40 μV 20 μV/V	HP 3458A, OPT 002

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Voltage ³ – Measure			
220 μV 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	0.030 % + 4.0 μV 0.020 % + 3.0 μV 0.030 % + 3.0 μV 0.10 % + 3.0 μV 0.60 % + 2.0 μV 4.6 % + 3.0 μV	HP 3458A
(10 to 100) 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 (0.3 to 1) MHz	70 μV/V + 50 μV 0.010 % + 9.0 μV 0.010 % + 9.0 μV 0.030 % + 8.0 μV 0.090 % + 5.0 μV 0.35 % + 10 μV 1.2 % + 30 μV	
(0.1 to 1) 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 (0.3 to 1) MHz	70 μV/V + 60 μV 70 μV/V + 40 μV 0.020 % + 40 μV 0.030 % + 40 μV 0.090 % + 30 μV 0.35 % + 100 μV 1.2 % + 300 μV	
(1 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 (0.3 to 1) MHz	70 μV/V + 0.70 mV 60 μV/V + 0.60 mV 0.010 % + 0.60 mV 0.030 % + 0.50 mV 0.090 % + 0.40 mV 0.35 % + 1.3 mV 1.2 % + 5.6 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.020 % + 5.7 mV 0.020 % + 3.8 mV 0.020 % + 3.8 mV 0.040 % + 3.4 mV 0.14 % + 3.3 mV	
(100 to 700) V	40 Hz to 1 kHz	0.050 % + 30 mV	

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Current ³ – Measure			HP 3458A
(10 to 100) μA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 1) kHz	0.46 % + 0.040 μA 0.17 % + 0.040 μA 0.070 % + 0.040 μA 0.070 % + 0.040 μA	
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 0.30 μA 0.17 % + 0.30 μA 0.060 % + 0.40 μA 0.030 % + 0.40 μA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 3.0 μA 0.16 % + 4.0 μA 0.050 % + 5.0 μA 0.020 % + 5.0 μA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.46 % + 30 μA 0.16 % + 40 μA 0.060 % + 40 μA 0.020 % + 40 μA	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.1 to 5) kHz	0.45 % + 400 μA 0.15 % + 700 μA 0.060 % + 800 μA 0.090 % + 700 μA	

Parameter/Equipment	Range	CMC ² (±)	Comments
DC Voltage – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 700) V	6.0 μV/V + 0.60 μV 6.0 μV/V + 0.60 μV 4.0 μV/V + 3.0 μV 4.0 μV/V + 2.0 μV 5.0 μV/V + 40 μV 8.0 μV/V + 300 μV	Fluke 5720A

Parameter/Equipment	Range	CMC ² (±)	Comments
DC Current – Generate	(1 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	40 μ A/A + 6.0 nA 30 μ A/A + 6.0 nA 30 μ A/A + 40 nA 70 μ A/A + 0.30 μ A 80 μ A/A + 10 μ A	Fluke 5720A
DC Resistance – Generate Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	90 $\mu\Omega$ 0.17 m Ω 0.23 m Ω 0.43 m Ω 1.1 m Ω 2.0 m Ω 9.3 m Ω 0.017 Ω 0.093 Ω 0.17 Ω 1.1 Ω 2.1 Ω 19 Ω 38 Ω 0.44 k Ω 0.95 k Ω 12 k Ω	Fluke 5720A

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Voltage ³ – Generate (0.2 to 2.2) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.010 % + 5.0 μ V 0.020 % + 4.0 μ V 60 μ V/V + 4.0 μ V 0.020 % + 4.0 μ V 0.030 % + 6.0 μ V 0.11 % + 10 μ V 0.11 % + 20 μ V 0.22 % + 20 μ V	Fluke 5720A

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Voltage ³ – Generate (cont)			
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.060 % + 4.0 μV 0.040 % + 4.0 μV 0.030 % + 4.0 μV 0.020 % + 4.0 μV 0.080 % + 5.0 μV 0.14 % + 10 μV 0.14 % + 20 μV 0.27 % + 20 μV	Fluke 5720A
(22 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 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.030 % + 10 μV 0.020 % + 10 μV 90 μV/V + 7.0 μV 0.020 % + 7.0 μV 0.050 % + 20 μV 0.090 % + 20 μV 0.13 % + 30 μV 0.26 % + 50 μV	
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 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.030 % + 40 μV 0.020 % + 40 μV 90 μV/V + 20 μV 70 μV/V + 10 μV 0.010 % + 30 μV 0.040 % + 80 μV 0.10 % + 200 μV 0.15 % + 400 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 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.030 % + 0.40 mV 0.020 % + 0.40 mV 90 μV/V + 0.20 mV 70 μV/V + 90 μV 0.010 % + 0.20 mV 0.030 % + 0.60 mV 0.090 % + 0.90 mV 0.14 % + 3.1 mV	

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Voltage ³ – Generate (cont)			
(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 to 300) kHz	0.030 % + 3.5 mV 0.020 % + 3.8 mV 90 μV/V + 1.5 mV 80 μV/V + 0.90 mV 0.14 % + 1.6 mV 0.090 % + 15.4 mV	Fluke 5720A
(220 to 700) V	(15 to 50) kHz 50 Hz to 1 kHz	90 μV/V + 1.6 mV 80 μV/V	
AC Current ³ – Generate			
(0 to 0.22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.020 % + 20 nA 0.020 % + 20 nA 0.010 % + 20 nA 0.020 % + 20 nA 1.0 % + 60 nA	Fluke 5720A
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz	0.020 % + 40 nA 0.020 % + 40 nA 0.020 % + 30 nA 0.020 % + 100 nA	
(0.22 to 2.2) mA	(5 to 10) kHz	0.10 % + 600 nA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.020 % + 200 nA 0.020 % + 200 nA 0.020 % + 100 nA 0.020 % + 300 nA 0.090 % + 3.0 μA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.020 % + 2.0 μA 0.020 % + 4.0 μA 0.020 % + 3.0 μA 0.020 % + 3.0 μA 0.10 % + 10 μA	

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Current ³ – Generate (cont) 220 mA to 1.3 A	20 Hz to 1kHz (1 to 5) kHz (5 to 10) kHz	0.030 % + 30 µA 0.040 % + 80 µA 0.62 % + 0.20 mA	Fluke 5720A

II. Time & Frequency

Parameter/Equipment	Frequency	CMC ² (±)	Comments
Frequency	12 kHz to 3.2 GHz	0.27 µHz/Hz	Wavetek 9500 option 100, Fluke 9500B

¹ This laboratory offers commercial 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 In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted.



American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

TFF CORPORATION TEKTRONIX COMPANY

Kanagawa Pref., JAPAN

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 25th day of February 2014.



A handwritten signature in black ink, appearing to read "Peter Meyer".

President & CEO
For the Accreditation Council
Certificate Number 2357.02
Valid to February 29, 2016

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