SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: April 30, 2021 Certificate Number: 1607.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 6] :

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
DC Voltage[3] – Generate	Up to 329.9999 mV 330 mV to 3.299 999 V (3.3 to 32.9999) V (33 to 329.9999) V (330 to 1000) V	81 µV/V + 3 µV 61 µV/V + 5 µV 120 µV/V + 50 µV 1.0 mV/V + 500 µV 2.8 mV/V + 1.5 mV	Fluke 5500A
DC Voltage[3] – Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	6.1 µV/V + 0.1 µV 4.2 µV/V + 0.4 µV 4.2 µV/V + 4 µV 6.6 µV/V + 40 µV 14 µV/V + 500 µV	Fluke 8508A
DC Current[3] – Generate	(0.3 to 3.29) mA (3.3 to 32.9) mA (33 to 329.9) mA 330 mA to 2 A (2 to 11) A (11 to 550) A	0.016 % + 0.05 µA 0.013 % + 0.25 µA 0.059 % + 3.3 µA 0.066 % + 44 µA 0.11 % + 330 µA 3.8 A	Fluke 5500A Fluke 5500A w/ 50-turn coil

Parameter/Equipment	Range[4]	CMC[2, 5] (±)	Comments
DC Current[3] – Measure	Up to 200 µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	15 µA/A + 0.4 nA 16 µA/A + 4.0 nA 18 µA/A + 40.0 nA 60 µA/A + 800 nA 0.022 % + 16 µA 0.047 % + 400 µA	Fluke 8508A
Capacitance[3] – Generate	(0.33 to 11) nF 11 nF to 1.1 µF (1.1 to 11) µF (11 to 33) µF (33 to 110) µF (110 to 330) µF 330 µF to 1 mF	0.6 % + 0.01 nF 0.3 % + 0.1 nF 0.5 % + 10 nF 0.47 % + 30 nF 0.6 % + 100 nF 0.9 % + 300 nF 1.2 % + 300 nF	Fluke 5500A
Resistance[3] – Generate	Up to 10.99 Ω (11 to 32.99) Ω (33 to 109.9) Ω (110 to 329.9) Ω 330 Ω to 1.09 kΩ (1.1 to 3.29) kΩ (3.3 to 10.9) kΩ (11 to 32.9) kΩ (33 to 109.9) kΩ (110 to 329.9) kΩ 330 kΩ to 1.09 MΩ (1.1 to 3.29) MΩ (3.3 to 10.9) MΩ (11 to 32.9) MΩ (33 to 109.9) MΩ (110 to 330) MΩ	0.08 % + 8 mΩ 0.053 % + 15 mΩ 0.03 % + 15 mΩ 0.015 % + 15 mΩ 0.017 % + 0.06 Ω 0.013 % + 0.06 Ω 0.018 % + 0.6 Ω 0.013 % + 0.6 Ω 0.02 % + 6 Ω 0.017 % + 6 Ω 0.024 % + 55 Ω 0.02 % + 55 Ω 0.076 % + 550 Ω 0.12 % + 550 Ω 0.6 % + 5.5 kΩ 0.6 % + 17 kΩ	Fluke 5500A
Resistance[3] – Measure	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ	23 µΩ/Ω + 4 µΩ 13 µΩ/Ω + 14 µΩ 9.3 µΩ/Ω + 50 µΩ 9.3 µΩ/Ω + 500 µΩ 9.3 µΩ/Ω + 5 mΩ 9.3 µΩ/Ω + 50 mΩ 11 µΩ/Ω + 1 Ω 27 µΩ/Ω + 100 Ω 0.018 % + 10 kΩ 0.19 % + 1 MΩ	Fluke 8508A

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Resistance[3] – Measure (cont)			
High Voltage	(0 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	20 µΩ/Ω + 10 Ω 76 µΩ/Ω + 1 kΩ 0.025 % + 100 kΩ 0.21 % + 10 MΩ	Fluke 8508A

Parameter/Range[4]	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate			
(1 to 33) mV	45 Hz to 10 kHz (10 to 50) kHz (50 to 100) kHz	0.2 % + 20 µV 0.3 % + 20 µV 0.4 % + 33 µV	Fluke 5500A
(33 to 330) mV	45 Hz to 10 kHz (10 to 50) kHz (50 to 100) kHz	0.1 % + 20 µV 0.2 % + 20 µV 0.3 % + 170 µV	
330 mV to 3.3 V	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.05 % + 60 µV 0.12 % + 60 µV 0.18 % + 300 µV 0.3 % + 1.7 mV	
(3.3 to 33) V	45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 600 µV 0.1 % + 2.6 mV 0.22 % + 5 mV 0.3 % + 17 mV	
(33 to 330) V	45 Hz to 20 kHz	0.15 % + 33 µV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 10) kHz	0.08 % + 80 µV 0.25 % + 500 µV	

Parameter/Range[4]	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Measure			
(0 to 200) mV	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.018 % + 4 µV 0.04 % + 8 µV 0.09 % + 20 µV	Fluke 8508A
200 mV to 2 V	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.013 % + 20 µV 0.026 % + 40 µV 0.07 % + 200 µV 0.45 % + 2 mV 2.2 % + 20 mV	
(2 to 20) V	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.013 % + 200 µV 0.026 % + 400 µV 0.07 % + 2 mV 0.45 % + 20 mV 2.2 % + 200 mV	
(20 to 200) V	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.013 % + 2 mV 0.026 % + 4 mV 0.07 % + 20 mV 0.45 % + 200 mV 2.2 % + 2 V	
(200 to 1000) V	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.06 % + 20 mV 0.07 % + 40 mV 0.1 % + 200 mV	

Parameter/Range[4]	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate			
(0.029 to 0.329) mA	20 Hz to 5 kHz	0.47 % + 0.15 µA	Fluke 5500A
(0.33 to 3.29) mA	20 Hz to 5 kHz	0.23 % + 0.3 µA	
(3.3 to 32.9) mA	20 Hz to 1 kHz (1 to 5) kHz	0.12 % + 3 µA 0.23 % + 3 µA	
(33 to 329.9) mA	20 Hz to 1 kHz (1 to 5) kHz	0.13 % + 30 µA 0.24 % + 30 µA	
330 mA to 2.2 A	45 Hz to 1 kHz (1 to 5) kHz	0.14 % + 300 µA 0.89 % + 300 µA	
(2.2 to 11) A	(45 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz	0.094 % + 2 mA 0.14 % + 2 mA 0.41 % + 2 mA	
(11 to 550) A	(45 to 65) Hz (65 to 500) Hz	3.8 A 3.8 A	Fluke 5500A w/ 50-turn coil
AC Current[3] – Measure			
(0 to 200) µA	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.07 % + 20 nA 0.09 % + 20 nA 0.53 % + 20 nA	Fluke 8508A
200 µA to 2 mA	10 Hz to 10 kHz (10 to 100) kHz	0.045 % + 200 nA 0.55 % + 200 nA	
(2 to 20) mA	10 Hz to 10 kHz (10 to 100) kHz	0.045 % + 2 µA 0.55 % + 2 µA	
(20 to 200) mA	10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.07 % + 20 µA 0.083 % + 20 µA 0.6 % + 20 µA	
200 mA to 2 A	10 Hz to 30 kHz	0.087 % + 200 µA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.1 % + 2 mA 0.4 % + 2 mA	

Parameter/Equipment	Range[4]	CMC[2] (±)	Comments
Thermocouple Simulation[3] –			
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.36 °C 0.31 °C 0.37 °C 0.59 °C 0.98 °C	Fluke 5500A
Type E	(-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.17 °C 0.19 °C 0.25 °C	
Type J	(-30 to 150) °C (150 to 760) °C	0.17 °C 0.20 °C	
Type K	(-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.19 °C 0.30 °C 0.47 °C	
Type N	(-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.3 °C 0.3 °C 0.4 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.67 °C 0.41 °C 0.39 °C 0.47 °C	
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.55 °C 0.43 °C 0.54 °C	
Type T	(-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.28 °C 0.19 °C 0.17 °C	

Parameter/Equipment	Range[4]	CMC[2, 7] (±)	Comments
RTD Simulation[3] –			
10 Ω Copper 427	(-100 to 260) °C	0.35 °C	Fluke 5500A
100 Ω Platinum 385	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.06 °C 0.09 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	
1000 Ω Platinum 385	(-200 to 100) °C (100 to 300) °C (300 to 600) °C (600 to 630) °C	0.05 °C 0.07 °C 0.08 °C 0.26 °C	
RTD[3] – Measure	(2 to 20) Ω 20 Ω to 200 kΩ	13 μΩ/Ω 9.3 μΩ/Ω	Fluke 8508A

II. Thermodynamics

Parameter/Equipment	Range[4]	CMC[2, 7] (±)	Comments
Temperature[3] – Measure	(-10 to 150) °C (150 to 650) °C	0.06 °C 0.12 °C	Hart 5626, fluke 8508A
Humidity[3] – Measure	(11 to 80) % RH	2.2 % RH	Vaisala HMP45A

III. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency[3] – Measure	1 Hz to 225 MHz	0.21 μHz/Hz	Agilent 53131A

[1] This laboratory offers commercial calibration service and field calibration service.

[2] Calibration and Measurement Capability Uncertainty (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. CMCs 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] Where ranges overlap, the uncertainty for the overlapping specifications will be the lower of the two uncertainties.

[5] The stated measured values are determined using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure or generate the measured value in the ranges indicated. CMC are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.

[6] This scope meets A2LA's P112 Flexible Scope Policy

[7] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter

Accredited Laboratory

A2LA has accredited

ELECTRO-LAB SERVICES, INC.

Evansville, IN

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets R205 – Specific Requirements: Calibration Laboratory Accreditation Program. 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 April 2017*).

Presented this 31st day of December 2019.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1607.01
Valid to April 30, 2021

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