



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

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CALIBRATION

Valid To: August 31, 2022

Certificate Number: 2220.01

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 | CMC ^{2, 4} (±) | 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 1020) V | 7.7 µV 40 µV 0.43 mV 6.0 mV 20 mV | Fluke 5522A |
| DC Voltage ³ – Measure | (0 to 100) mV >100 mV to 1 V (>1 to 10) V (>10 to 100) V (>100 to 1000) V | 1.9 µV 7.3 µV 63 µV 0.84 mV 21 mV | Agilent 3458A |
| DC Current ³ – Generate | (100 to 330) µA >330 µA to 3.3 mA (>3.3 to 33) mA (>33 to 330) mA >330 mA to 3A (>3 to 20) A | 70 nA 0.38 µA 3.6 µA 36 µA 1.2 mA 21 mA | Fluke 5522A |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|------------------------------------|---|---|--|
| DC Current ³ – Measure | (10 to 100) μ A >100 μ A to 1 mA (>1 to 10) mA (>10 to 100) mA >100 mA to 1 A | 6.5 nA 26 nA 0.23 μ A 1.0 μ A 0.12 mA | Agilent 3458A |
| Resistance ³ – Generate | (0 to 11) Ω (>11 to 33) Ω (>33 to 110) Ω (>110 to 330) Ω >330 Ω to 1.1 k Ω (>1.1 to 3.3) k Ω (>3.3 to 11) k Ω (>11 to 33) k Ω (>33 to 110) k Ω (>110 to 330) k Ω >330 k Ω to 1.1 M Ω (>1.1 to 3.3) M Ω (>3.3 to 11) M Ω (>11 to 33) M Ω (>33 to 110) M Ω (>110 to 330) M Ω | 5.8 m Ω 5.9 m Ω 6.6 m Ω 11 m Ω 32 m Ω 96 m Ω 0.32 Ω 0.96 Ω 3.2 Ω 11 Ω 36 Ω 0.21 k Ω 1.5 k Ω 8.5 k Ω 58 k Ω 1.0 M Ω | Fluke 5522A (Applies to 4-wire compensation only) |
| Resistance ³ – Measure | (0 to 10) Ω (>10 to 100) Ω >100 Ω to 1 k Ω (>1 to 10) k Ω (>10 to 100) k Ω >100 k Ω to 1 M Ω (>1 to 10) M Ω (>10 to 100) M Ω | 0.36 m Ω 2.1 m Ω 13 m Ω 0.014 Ω 1.5 Ω 23 Ω 0.77 k Ω 52 k Ω | Agilent 3458A |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments |
|------------------------------------|--|--|-------------|
| AC Voltage ³ – Generate | | | |
| (1.0 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 | 0.33 μV 0.11 μV 0.13 μV 0.40 μV 13 mV 32 mV | Fluke 5522A |
| (>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 | 0.11 mV 57 μV 62 μV 0.12 mV 0.30 mV 0.73 mV | |
| >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 | 1.1 mV 0.56 mV 0.69 mV 1.1 mV 2.4 mV 8.6 mV | |
| (>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 | 11 mV 5.6 mV 8.6 mV 12 mV 31 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 | 66 mV 73 mV 89 mV 0.11 V 0.71 V | |
| (>330 to 1020) V | 45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz | 0.32 V 0.27 V 0.32 V | |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments |
|-----------------------------------|---|---|---------------|
| AC Voltage ³ – Measure | | | |
| (10 to 100) mV | (1 to 40) Hz 40 Hz to 1 kHz (>1 to 20) kHz (>20 to 100) kHz (50 to 100) kHz (>100 to 300) kHz | 13 μV 17 μV 28 μV 120 μV 82 μV 0.24 mV | Agilent 3458A |
| >100 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 | 1.3 mV 1.1 mV 1.8 mV 3.5 mV 8.4 mV 31 mV | |
| (>10 to 100) V | 1 Hz to 1 kHz 40 Hz to 1 kHz (>1 to 20) kHz (>20 to 50) kHz (>50 to 100) kHz | 23 mV 22 mV 23 mV 43 mV 0.030 V | |
| >100 V to 1 kV | 1 Hz to 1 kHz (>1 to 20) kHz | 430 mV 630 mV | |

| Parameter/Range | Frequency | CMC ^{2, 4} (±) | Comments |
|------------------------------------|--|---|-------------|
| AC Current ³ – Generate | | | |
| (100 to 330) μA | (10 to 20) Hz (>20 to 45) Hz >45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz (>10 to 30) kHz | 0.77 μA 0.60 μA 0.52 μA 1.1 μA 2.8 μA 5.7 μA | Fluke 5522A |
| >330 μA to 3.3 mA | (10 to 20) Hz (>20 to 45) Hz >45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz (>10 to 30) kHz | 6.8 μA 4.3 μA 3.5 μA 3.5 μA 17 μA 34 μA | |
| (<3.3 to 33) mA | (0 to 10) Hz (>10 to 45) Hz >45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz (>10 to 30) kHz | 62 μA 32 μA 16 μA 29 μA 70 μA 0.14 mA | |
| (>33 to 330) mA | (0 to 10) Hz (>10 to 45) Hz >45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz (>10 to 30) kHz | 0.62 mA 0.32 mA 0.16 mA 0.38 mA 0.77 mA 1.6 mA | |
| (>0.33 to 2.99) A | (10 to 45) Hz >45 Hz to 1 kHz (>1 to 5) kHz (>5 to 10) kHz | 5.6 mA 2.1 mA 19 mA 80 mA | |
| (>2.99 to 20.5) A | (45 to 100) Hz >100 Hz to 1 kHz (>1 to 5) kHz | 30 mA 10 mA 0.62 A | |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments |
|-----------------------------------|--|---|---------------|
| AC Current ³ – Measure | | | |
| 0 A to 100 µA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 1 kHz | 0.43 µA 0.18 µA 96 nA 98 nA | Agilent 3458A |
| >100 µA to 1 mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 1 kHz (5 to 20) kHz | 4.1 µA 1.7 µA 0.89 µA 20 µA 0.88 µA | |
| (>1 to 10) mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 1 kHz (5 to 20) kHz | 42 µA 17 µA 8.3 µA 6.3 µA 8.3 µA | |
| (>10 to 100) mA | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 1 kHz (5 to 20) kHz | 0.42 mA 0.17 mA 82 µA 31 µA 82 µA | |
| >100 mA to 1 A | (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 1 kHz (5 to 20) kHz | 4.1 mA 1.8 mA 8 mA 1.2 mA 3.1 mA | |

| Parameter/Range | Frequency | CMC ^{2,4} (±) | Comments |
|-------------------------------------|-----------|------------------------|-------------|
| Capacitance ³ – Generate | | | Fluke 5522A |
| (0.04 to 1.1) nF | 1 kHz | 15 pF | |
| (>1.1 to 3.3) nF | 1 kHz | 27 pF | |
| (>3.3 to 110) nF | 1 kHz | 0.29 nF | |
| (>110 to 330) nF | 1 kHz | 0.88 nF | |
| (>0.33 to 1.1) μF | 100 Hz | 3.8 nF | |
| (>1.1 to 3.3) μF | 100 Hz | 11 nF | |
| (>3.3 to 11) μF | 100 Hz | 39 nF | |
| (>11 to 33) μF | 100 Hz | 0.17 μF | |
| (>33 to 110) μF | 50 Hz | 0.61 μF | |
| (>110 to 330) μF | 50 Hz | 1.8 μF | |
| (>0.33 to 1.1) mF | DC | 6.1 μF | |
| (>1.1 to 3.3) mF | DC | 18 μF | |
| (>3.3 to 11) mF | DC | 60 μF | |
| (>11 to 33) mF | DC | 0.28 mF | |
| (33 to 110) mF | DC | 1.3 mF | |

| Parameter/Equipment | Range | CMC ^{2,4} (±) | Comments |
|------------------------------------|------------------|------------------------|-----------------------|
| Capacitance ³ – Measure | (0 to 20) nF | 0.47 nF | IET DE-6000 LCR Meter |
| | (20 to 200) nF | 0.6 nF | |
| | (200 to 2000) nF | 6 nF | |
| | (0 to 20) μF | 0.13 μF | |
| | (20 to 200) μF | 1.2 μF | |
| | (200 to 2000) μF | 0.42 mF | |

| Parameter/Equipment | Range | CMC ^{2, 4} (±) | Comments |
|---|---|---|-------------|
| Electrical Calibration of Thermocouple Indicating Devices ³ – Measure and Generate | | | |
| Type J | (-210 to -100) °C (>-100 to -30) °C (>-30 to 150) °C (>150 to 760) °C (>760 to 1200) °C | 0.83 °C 0.30 °C 0.25 °C 0.64 °C 0.66 °C | Fluke 5522A |
| Type K | (-200 to -100) °C (>-100 to -25) °C (>-25 to 120) °C (>120 to 1000) °C (>1000 to 1372) °C | 0.44 °C 0.33 °C 0.26 °C 0.39 °C 0.49 °C | |
| Type S | (0 to 250) °C (>250 to 1000) °C (>1000 to 1400) °C (>1400 to 1767) °C | 0.51 °C 0.39 °C 0.47 °C 0.50 °C | |
| Type T | (-250 to -150) °C (>-150 to 0) °C (>0 to 120) °C (>120 to 400) °C | 0.65 °C 0.25 °C 0.18 °C 0.17 °C | |

II. Fluid Quantities

| Parameter/Equipment | Range | CMC ^{2, 5} (±) | Comments |
|--------------------------------------|---|--|--|
| Air Flow Rate – Measure | (10 to 100) sccm (0.1 to 1) slm (1 to 10) slm (10 to 100) slm (40 to 400) slm | 0.46 sccm 0.041 slm 0.023 slm 0.25 slm 1.1 slm | DHI Molbloc |
| Air Flow Rate – Measure ³ | (5 to 500) sccm 500 sccm to 50 slm | 3.1 sccm 0.24 slm | Sierra Instruments primary gas flow calibrator |

III. Mechanical

| Parameter/Equipment | Range | CMC ^{2,5} (±) | Comments |
|----------------------------------|--|--|---------------------------------|
| Pressure – Measure ³ | (-30 to 30) in·H ₂ O (-3 to 3) in·H ₂ O (-14.5 to 25) psi (25 to 100) psi (100 to 300) psi (300 to 500) psi | 0.0019 in·H ₂ O 0.0004 in·H ₂ O 0.0017 psi 0.0023 psi 0.012 psi 0.029 psi | Ruska 725x pressure controllers |
| Balances & Scales ³ – | | | |
| 0.000 01 g Resolution | (0 to 5) g (0 to 20) g (0 to 50) g (0 to 100) g (0 to 200) g | 0.000 039 g 0.000 075 g 0.000 12 g 0.000 25 g 0.000 50 g | ASTM Class 1 weights |
| 0.0001 g Resolution | (0 to 50) g (0 to 100) g (0 to 200) g | 0.000 15 g 0.000 26 g 0.000 51 g | |
| 0.001 g Resolution | (0 to 200) g (0 to 500) g (0 to 1000) g | 0.000 95 g 0.0015 g 0.0028 g | |
| 0.01 g Resolution | (0 to 1500) g (0 to 5000) g | 0.0081 g 0.014 g | |
| 0.1 g Resolution | (0 to 10 000) g | 0.10 g | |
| 1 g Resolution | 25 kg 45 kg | 3.0 g 2.7 g | |

IV. Thermodynamics

| Parameter/Equipment | Range | CMC ^{2,5,6} (±) | Comments |
|--|---------------------------------|--------------------------|-----------------------------------|
| Relative Humidity – Measure ³ | (10 to 95) % RH (0 to 70) °C | 0.61 % RH 0.075 °C | Thunder Scientific 2500 generator |
| | (10 to 95) % RH | 1.3 % RH | Vaisala MI70 w/ HMP76B |

| Parameter/Equipment | Range | CMC ² (±) | Comments |
|---|-----------------|----------------------|--|
| Temperature ³ – Direct Measurement by Comparison | -196 °C | 0.025 °C | SPRT Hart Scientific 5699, Fluke 1595A Super thermometer |
| | (-80 to -20) °C | 0.012 °C | |
| | (-20 to 110) °C | 0.013 °C | |
| | (100 to 200) °C | 0.016 °C | |
| | (180 to 550) °C | 0.024 °C | |
| | (230 to 660) °C | 0.29 °C | Type “S” thermocouple |
| (>660 to 960) °C | 0.50 °C | | |

¹ This laboratory offers commercial 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 The measurands stated are generated using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure the measurand 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.

⁵ 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.

⁶ This scope meets A2LA’s P112 *Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

RS CALIBRATION SERVICES, INC. (a Trescal Company)

Pleasanton, CA

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 the requirements of ANSI/NC SL Z540-1-1994 and 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 4th day of November 2020.

A blue ink signature of a person, likely a representative of the Accreditation Council.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2220.01
Valid to August 31, 2022

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