Accredited Laboratory

A2LA has accredited

RS CALIBRATION SERVICES, INC.

Pleasanton, CA

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/NCSLI 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 13th day of June 2018.

President and CEO
For the Accreditation Council
Certificate Number 2220.01
Valid to April 30, 2020

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

RS CALIBRATION SERVICES, INC.
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CALIBRATION

Valid To: April 30, 2020 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]:

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

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Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Current[3] – Measure	(10 to 100) µA >100 µA to 1 mA (>1 to 10) mA (>10 to 100) mA >100 mA to 1 A	6.5 nA 26 nA 0.23 µA 1.0 µA 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 kΩ (>1.1 to 3.3) kΩ (>3.3 to 11) kΩ (>11 to 33) kΩ (>33 to 110) kΩ (>110 to 330) kΩ >330 kΩ to 1.1 MΩ (>1.1 to 3.3) MΩ (>3.3 to 11) MΩ (>11 to 33) MΩ (>33 to 110) MΩ (>110 to 330) MΩ	5.8 mΩ 5.9 mΩ 6.6 mΩ 11 mΩ 32 mΩ 96 mΩ 0.32 Ω 0.96 Ω 3.2 Ω 11 Ω 36 Ω 0.21 kΩ 1.5 kΩ 8.5 kΩ 58 kΩ 1.0 MΩ	Fluke 5522A (Applies to 4-wire compensation only)
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 to 10) MΩ (>10 to 100) MΩ	0.36 mΩ 2.1 mΩ 13 mΩ 0.014 Ω 1.5 Ω 23 Ω 0.77 kΩ 52 kΩ	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			
(0.04 to 1.1) nF	1 kHz	15 pF	Fluke 5522A
(>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 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	Fluke 5522A
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	
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	
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	

II. Fluid Quantities

Parameter/Equipment	Range	CMC[2] (±)	Comments
Air Flow Rate	(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[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] (±)	Comments
Pressure[3]	(-30 to 30) in·H_2O (-3 to 3) in·H_2O (-14.5 to 25) psi (25 to 100) psi (100 to 300) psi (300 to 500) psi	0.0019 in·H_2O 0.0004 in·H_2O 0.0017 psi 0.0023 psi 0.012 psi 0.029 psi	Ruska 725x pressure controllers
Balances and 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	3.0 g	NIST F Class weights
	45 kg	2.7 g	NIST F Class and Class 1 weights

IV. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Relative Humidity[3]	(10 to 90) % RH (0 to 70) °C (10 to 90) % RH	0.61 % RH 0.075 °C 1.3 % RH	Thunder Scientific 2500 generator Vaisala MI70 w/HMP76B
Temperature[3] – Direct Measurement by Comparison	-196 °C (-80 to -20) °C 0 °C (TPW) (-20 to 110) °C (100 to 200) °C (180 to 550)°C (230 to 660) °C (>660 to 960) °C -196 °C 0 °C (TPW)	0.025 °C 0.012 °C 0.0036 °C 0.013 °C 0.016 °C 0.024 °C 0.29 °C 0.50 °C 0.056 °C 0.054 °C	SPRT Hart Scientific 5699, Fluke 1595A Super thermometer Type "S" thermocouple PRT(5615) with meter (1523)

[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.