



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

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CALIBRATION

Valid To: July 31, 2018

Certificate Number: 3316.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1</sup>:

I. Chemical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
CO <sub>2</sub> – Measure <sup>3</sup>	(0 to 4) % CO <sub>2</sub> (4 to 6) % CO <sub>2</sub> (6 to 10) % CO <sub>2</sub>	0.32 % CO <sub>2</sub> 0.38 % CO <sub>2</sub> 0.45 % CO <sub>2</sub>	Vaisala GMP 221
Gas Detection Equipment <sup>3</sup> – CO <sub>2</sub>	10 % CO <sub>2</sub>	0.11 % CO <sub>2</sub>	Reference CO <sub>2</sub> gas – EPA protocol
pH Meters	4 pH 7 pH 10 pH	0.012 pH 0.013 pH 0.017 pH	Standard solutions

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 4, 5</sup> (±)	Comments
DC Current – Measure <sup>3</sup>	Up to 200 µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A	12 µA/A + 0.4 nA 12 µA/A + 4 nA 13 µA/A + 40 nA 36 µA/A + 0.8 µA 0.017 % + 16 µA	Fluke 8508A

Parameter/Equipment	Range	CMC <sup>2, 4, 5</sup> ( $\pm$ )	Comments
DC Current – Measure <sup>3</sup> (cont)	(2 to 20) A	0.038 % + 0.4 mA	Fluke 8508A
	(2 to 50) A	0.012 %	Fluke 8508A w/ Ohm Labs CS-50 shunt
DC Current – Generate <sup>3</sup>	(0 to 330) $\mu$ A 330 $\mu$ A to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 2.3) A (2.3 to 11) A (11 to 20.5) A	0.015 % + 20 nA 0.01 % + 50 nA 0.01 % + 250 nA 0.01 % + 2.5 $\mu$ A 0.02 % + 40 $\mu$ A 0.038 % + 40 $\mu$ A 0.05 % + 500 $\mu$ A 0.1 % + 750 $\mu$ A	Fluke 5522A
DC Voltage – Measure <sup>3</sup>	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	4.5 $\mu$ V/V + 110 nV 3.0 $\mu$ V/V + 500 nV 3.0 $\mu$ V/V + 4 $\mu$ V 4.5 $\mu$ V/V + 50 $\mu$ V 4.5 $\mu$ V/V + 500 $\mu$ V	Fluke 8508A
DC Voltage– Generate <sup>3</sup>	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1020) V	20 $\mu$ V/V + 1 $\mu$ V 11 $\mu$ V/V + 2 $\mu$ V 12 $\mu$ V/V + 20 $\mu$ V 18 $\mu$ V/V + 150 $\mu$ V 18 $\mu$ V/V + 1.5 mV	Fluke 5522A
Resistance – Measure <sup>3</sup>	Up to 2 $\Omega$ (2 to 20) $\Omega$ (20 to 200) $\Omega$ 200 $\Omega$ to 2 k $\Omega$ (2 to 20) k $\Omega$ (20 to 200) k $\Omega$ 200 k $\Omega$ to 2 M $\Omega$ (2 to 20) M $\Omega$ (20 to 200) M $\Omega$ 200 M $\Omega$ to 2 G $\Omega$	15 $\mu\Omega/\Omega$ + 5 $\mu\Omega$ 9 $\mu\Omega/\Omega$ + 16 $\mu\Omega$ 7.5 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 7.5 $\mu\Omega/\Omega$ + 0.5 m $\Omega$ 7.5 $\mu\Omega/\Omega$ + 5 m $\Omega$ 7.5 $\mu\Omega/\Omega$ + 50 m $\Omega$ 8.5 $\mu\Omega/\Omega$ + 1 $\Omega$ 15 $\mu\Omega/\Omega$ + 100 $\Omega$ 60 $\mu\Omega/\Omega$ + 10 k $\Omega$ 0.053 % + 1 M $\Omega$	Fluke 8508A

Parameter/Equipment	Range	CMC <sup>2,4,5</sup> (±)	Comments
Resistance – Generate <sup>3</sup>	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 kΩ (1.1 to 11) kΩ (11 to 110) kΩ 110 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 (330 to 1100) MΩ	40 μΩ/Ω + 0.001 Ω 30 μΩ/Ω + 0.0015 Ω 28 μΩ/Ω + 0.0014 Ω 28 μΩ/Ω + 0.002 Ω 28 μΩ/Ω + 0.02 Ω 28 μΩ/Ω + 0.2 Ω 32 μΩ/Ω + 2 Ω 60 μΩ/Ω + 30 Ω 0.013 % + 50 Ω 0.025 % + 2.5 kΩ 0.05 % + 3 kΩ 0.3 % + 100 kΩ 1.5 % + 500 kΩ	Fluke 5522A

Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup>			
Up to 200 mV	(1 to 10) Hz (10 to 20) Hz (20 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.1 % + 100 μV 0.1 % + 100 μV 0.025 % + 50 μV 0.011 % + 4 μV 0.011 % + 2 μV 0.011 % + 4 μV 0.031 % + 8 μV 0.071 % + 20 μV	Fluke 8508A
200 mV to 2V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.014 % + 120 μV 0.011 % + 20 μV 85 μV/V + 20 μV 65 μV/V + 20 μV 85 μV/V + 20 μV 0.021 % + 40 μV 0.051 % + 200 μV 0.3 % + 2 mV 1 % + 20 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.014 % + 1.2 mV 0.011 % + 200 μV 85 μV/V + 200 μV 65 μV/V + 200 μV 85 μV/V + 200 μV 0.021 % + 400 μV 0.051 % + 2 mV 0.3 % + 20 mV 1 % + 200 mV	

Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup> (cont)			
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.014 % + 12 mV 0.011 % + 2 mV 85 μV/V + 2 mV 65 μV/V + 2 mV 85 μV/V + 2 mV 0.021 % + 4 mV 0.051 % + 20 mV 0.3 % + 200 mV 1 % + 2 V	Fluke 8508A
(20 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.014 % + 70 mV 0.011 % + 20 mV 95 μV/V + 20 mV 0.021 % + 40 mV 0.051 % + 200 mV	

Parameter/Range	Frequency	CMC <sup>2, 4, 5</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup>			
(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	0.08 % + 23 μV 0.015 % + 6 μV 0.02 % + 6 μV 0.1 % + 6 μV 0.35 % + 12 μV 0.8 % + 50 μV	Fluke 5522A
(33 to 330) mV	(10 to 20) Hz (20 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.2 % + 8 μV 0.03 % + 8 μV 0.015 % + 8 μV 0.016 % + 8 μV 0.035 % + 8 μV 0.08 % + 32 μV 0.2 % + 70 μV	
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	0.03 % + 50 μV 0.015 % + 60 μV 0.019 % + 60 μV 0.03 % + 50 μV 0.07 % + 130 μV 0.24 % + 600 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	0.03 % + 650 μV 0.015 % + 600 μV 0.024 % + 600 μV 0.035 % + 600 μV 0.09 % + 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	0.019 % + 2 mV 0.02 % + 6 mV 0.025 % + 6 mV 0.03 % + 6 mV 0.2 % + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 10 mV 0.025 % + 10 mV 0.03 % + 10 mV	

Parameter/Range	Frequency	CMC <sup>2, 4, 5</sup> (±)	Comments
AC Current – Generate <sup>3</sup>			
(29 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	0.2 % + 100 nA 0.15 % + 100 nA 0.13 % + 100 nA 0.3 % + 150 nA 0.8 % + 200 nA 1.6 % + 400 nA	Fluke 5522A
300 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	0.2 % + 150 nA 0.13 % + 150 nA 0.1 % + 150 nA 0.2 % + 200 nA 0.5 % + 300 nA 1.0 % + 600 nA	
(3.3 to 33.3) 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	0.18 % + 2 μA 0.09 % + 2 μA 0.04 % + 2 μA 0.08 % + 2 μA 0.2 % + 3 μA 0.4 % + 4 μA	
(33.3 to 330) 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	0.18 % + 20 μA 0.09 % + 20 μA 0.04 % + 20 μA 0.10 % + 50 μA 0.2 % + 100 μA 0.4 % + 200 μA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 100 μA 0.05 % + 100 μA 0.6 % + 1 mA 2.5 % + 5 mA	
(1.1 to 3.0) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.18 % + 100 μA 0.06 % + 100 μA 0.6 % + 1 mA 2.5 % + 5 mA	
(3.0 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.06 % + 2 mA 0.1 % + 2 mA 3.0 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3.0 % + 5 mA	

Parameter/Range	Frequency	CMC <sup>2, 4, 5</sup> (±)	Comments
AC Current – Measure <sup>3</sup>			
Up to 200 µA	1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.048 % + 20 nA 0.065 % + 20 nA 0.4 % + 20 nA	Fluke 8508A
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 200 nA 0.028 % + 200 nA 0.065 % + 200 nA 0.4 % + 200 nA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.029 % + 2 µA 0.028 % + 2 µA 0.065 % + 2 µA 0.4 % + 2 µA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.029 % + 20 µA 0.025 % + 20 µA 0.06 % + 20 µA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.06 % + 200 µA 0.071 % + 200 µA 0.3 % + 200 µA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.08 % + 2 mA 0.25 % + 2 mA	
(2 to 20) A	(1 to 10) Hz (10 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 20) kHz	0.022 % + 1.6 mA 0.022 % + 5 mA 0.022 % + 2.4 mA 0.022 % + 5 mA 0.025 % + 10 mA	
(20 to 50) A	(1 to 10) Hz 10 Hz to 10 kHz (10 to 20) kHz	0.022 % + 14 mA 0.022 % + 2.4 mA 0.024 % + 5 mA	Fluke 8508A w/ Ohm Labs CS-50 shunt
Distortion – Measure <sup>3</sup>			
50 mV to 300 V	20 Hz to 20 kHz (20 to 100) kHz	1.3 dB 2.4 dB	HP 8903A

Parameter/Equipment	Range	CMC <sup>2, 4, 5</sup> (±)	Comments
Capacitance – Generate <sup>3</sup>	(220 to 400) pF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.5 % + 10 pF 0.5 % + 0.01 nF 0.5 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.01 nF 0.25 % + 0.03 nF 0.25 % + 1 nF 0.25 % + 3 nF 0.25 % + 10 nF 0.40 % + 30 nF 0.45 % + 100 nF 0.45 % + 300 nF 0.45 % + 1 μF 0.45 % + 3 μF 0.45 % + 10 μF 0.75 % + 30 μF 1.1 % + 100 μF	Fluke 5522A
Electrical Calibration of Thermocouples – Generate and Measure <sup>3</sup>			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5522A
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.40 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.22 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.15 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to 410) °C (410 to 1300) °C	0.32 °C 0.19 °C 0.22 °C	



Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of Thermocouples – Generate and Measure <sup>3</sup>			
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1767) °C	0.45 °C 0.28 °C 0.32 °C	Fluke 5522A
Type S	(0 to 250) °C (250 to 1400) °C (1400 to 1767) °C	0.39 °C 0.29 °C 0.36 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 400) °C	0.50 °C 0.19 °C 0.13 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.22 °C	

### III. Mechanical

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Gauge Pressure <sup>3</sup>	(0 to 3) in·H <sub>2</sub> O (0 to 25) in·H <sub>2</sub> O	0.0027 in·H <sub>2</sub> O 0.031 in·H <sub>2</sub> O	Heise ST-2H / HQS-1
	(0 to 60) psig (0 to 100) psig (0 to 300) psig (0 to 600) psig (0 to 1000) psig	0.019 psig 0.060 psig 0.090 psig 0.19 psig 0.31 psig	Heise ST-2H / HQS-2
Gauge Pressure – Measuring Equipment <sup>3</sup>			
Pneumatic	(4 to 854) in·H <sub>2</sub> O	0.034 %	Ametek PKII
Hydraulic	(10 to 15 000) psig	0.03 %	Ametek T-150
Absolute Pressure – Measure <sup>3</sup>	(0 to 15) psia	0.0064 psia	Heise ST-2H / HQS-2

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Vacuum – Measure <sup>3</sup>	(0 to 30) in·Hg	0.011 in·Hg	Heise ST-2H / HQS-2

#### IV. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature – Measure <sup>3</sup>	(-196 to 200) °C (200 to 400) °C (400 to 660) °C	0.024 °C 0.034 °C 0.049 °C	Hart Scientific 5628 w/ Hart Scientific 1502A
Temperature – Measuring Equipment <sup>3</sup>	-196 °C -78 °C (-50 to 35) °C (35 to 200) °C (200 to 650) °C	0.058 °C 0.058 °C 0.031 °C 0.033 °C 0.13 °C	Hart Scientific 5628 w/ Hart Scientific 1502A with LN <sub>2</sub> , dry ice / ethanol slurry and baths
Controlled Temperature Units – Measure <sup>3</sup>			
Refrigerators	(2 to 8) °C	0.26 °C	RTD w/ temperature readout
-20 °C Freezers	(-30 to -10) °C	0.27 °C	
-80 °C Freezers	(-90 to -60) °C	0.30 °C	
Cryo Freezers	(-196 to -120) °C	0.52 °C	
Incubators	(0 to 65) °C	0.26 °C	
Relative Humidity – Measure <sup>3</sup>	Up to 90 % RH (90 to 100) % RH	1.4 % RH 2.1 % RH	Vaisala HMP77B
Relative Humidity – Measuring Equipment	LiCl 11% RH MgCl <sub>2</sub> 33% RH NaCl 75% RH K <sub>2</sub> SO <sub>4</sub> 97% RH	1.7 % RH 1.7 % RH 2.1 % RH 2.7 % RH	Salt solutions

## V. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Frequency – Measuring Equipment <sup>3</sup>	100 $\mu$ Hz to 15 MHz	24 parts in $10^6$ Hz	Agilent 33120A / Fluke 5522A
Frequency – Measure <sup>3</sup>	10 Hz to 1 MHz	12 parts in $10^6$ Hz + 2 digits	Fluke 8508A
Time – Measure <sup>3</sup>	1 s to 9:59:59:99 hr	0.001 % + 67 ms	Control Company 1221
Rotational Speed— Measure (Optical) <sup>3</sup>	(6 to 99 999) RPM	0.05 % + 0.6 RPM	Ametek 1726C

<sup>1</sup> This laboratory offers commercial calibration service and field calibration service.

<sup>2</sup> 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.

<sup>3</sup> 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.

<sup>4</sup> In the statement of CMC, the value is defined as the percentage of reading unless otherwise noted.

<sup>5</sup> 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. CMCs are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.



## *Accredited Laboratory*

A2LA has accredited

# **INSTRUMENT TECHNOLOGIES, INC.**

*Boise, ID*

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 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 29<sup>th</sup> day of July 2016.

A handwritten signature in blue ink, appearing to read "J. C. Bunt".

Senior Director of Quality and Communications  
For the Accreditation Council  
Certificate Number 3316.01  
Valid to July 31, 2018

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