



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

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CALIBRATION

Valid To: August 31, 2018

Certificate Number: 2736.01

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. Dimensional

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Inside, Outside, and Depth Micrometers <sup>3</sup>	Up to 1 in (1 to 2) in (2 to 3) in (3 to 5) in (5 to 6) in	110 µin 120 µin 140 µin 180 µin 210 µin	Gage blocks
Calipers <sup>3</sup>	Up to 6 in (6 to 10) in	810 µin 840 µin	Gage blocks, caliper checker
Dial Indicators <sup>3</sup>	Up to 0.5 in (0.5 to 1) in (1 to 2) in	56 µin 61 µin 77 µin	Gage blocks
Height Gages	Up to 1 in (1 to 12) in (12 to 18) in	370 µin 490 µin 620 µin	Gage blocks, caliper checker

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 5</sup> (±)	Comments
DC Voltage – Generate	(0 to 330) mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	24 μV/V + 1 μV 14 μV/V + 2 μV 15 μV/V + 20 μV 22 μV/V + 150 μV 22 μV/V + 1.5 mV	Fluke 5520A
DC Voltage – Measure	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	8.7 μV/V + 5.1 μV 7.1 μV/V + 5 μV 7.1 μV/V + 6.4 μV 8.6 μV/V + 64 μV 6.4 μV/V + 0.7 mV	Fluke 8508A
DC Current – Generate	(0 to 330) μA 330 μA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20) A	0.017 % + 0.02 μA 0.012 % + 0.05 μA 0.012 % + 0.25 μA 0.012 % + 2.5 μA 0.023 % + 40 μA 0.044 % + 40 μA 0.058 % + 500 μA 0.12 % + 750 μA	Fluke 5520A
DC Current – Measure	(0 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	16 μA/A + 5 nA 16 μA/A + 6.4 nA 18 μA/A + 57 nA 57 μA/A + 0.8 μA 0.022 % + 17 μA 0.048 % + 0.4 mA	Fluke 8508A
Resistance – Generate, Fixed Points	14 Ω 25 Ω 62.5 Ω 100 Ω 200 Ω 250 Ω 350 Ω 400 Ω 500 Ω 4 kΩ 10 kΩ 20 kΩ	0.69 μΩ/Ω 0.67 μΩ/Ω 0.56 μΩ/Ω 0.55 μΩ/Ω 0.68 μΩ/Ω 0.69 μΩ/Ω 0.61 μΩ/Ω 0.61 μΩ/Ω 0.6 μΩ/Ω 0.65 μΩ/Ω 0.67 μΩ/Ω 0.75 μΩ/Ω	Isotech RB802-18, Fluke 5520A



Parameter/Equipment	Range	CMC <sup>2,5</sup> (±)	Comments
Resistance – Generate (Cont.)  Fixed Points	40 kΩ 100 kΩ 107 kΩ 300 kΩ 400 kΩ 500 kΩ  (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 (330 to 1100) MΩ	0.59 μΩ/Ω 0.46 μΩ/Ω 0.47 μΩ/Ω 0.73 μΩ/Ω 1 μΩ/Ω 0.65 μΩ/Ω  48 μΩ/Ω + 0.01 Ω 43 μΩ/Ω + 0.015 Ω 33 μΩ/Ω + 0.015 Ω 33 μΩ/Ω + 0.02 Ω 33 μΩ/Ω + 0.02 Ω 33 μΩ/Ω + 0.2 Ω 33 μΩ/Ω + 0.11 Ω 33 μΩ/Ω + 1 Ω 33 μΩ/Ω + 10 Ω 38 μΩ/Ω + 10 Ω 38 μΩ/Ω + 10 Ω 71 μΩ/Ω + 150 Ω 0.015 % + 250 Ω 0.062 % + 2.5 kΩ 0.072 % + 3 kΩ 0.35 % + 100 kΩ 1.7 % + 500 kΩ	Fluke 5520A
Resistance – 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 11 μΩ/Ω + 50 μΩ 9.4 μΩ/Ω + 0.5 mΩ 9.4 μΩ/Ω + 5 mΩ 9.6 μΩ/Ω + 50 mΩ 12 μΩ/Ω + 1 Ω 49 μΩ/Ω + 100 Ω 0.031 % + 10 kΩ 0.18 % + 1 MΩ	Fluke 8508A

*John C. Bunt*

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
Capacitance – Generate, Frequency Range:  (0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 32.9999) nF (33 to 109.999) nF (110 to 329.999) nF 330 nF to 1.09999 µF (1.1 to 3.29999) µF (3.3 to 10.9999) µF (11 to 32.9999) µF (33 to 109.999) µF (110 to 329.999) µF 330 µF to 1.09999 mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	0.01 Hz to 1 kHz	25 % + 0.01 nF 22 % + 0.01 nF 21 % + 0.01 nF 0.3 % + 0.01 nF 0.35 % + 0.1 nF 0.3 % + 0.1 nF 0.3 % + 0.3 nF 0.3 % + 1 nF 0.3 % + 3 nF 0.3 % + 10 nF 0.47 % + 30 nF 0.53 % + 100 nF 0.53 % + 300 nF 0.52 % + 1 µF 0.52 % + 3 µF 0.52 % + 10 µF 0.87 % + 30 µF 1.3 % + 100 µF	Fluke 5520A

Parameter/Range	Range	CMC <sup>2,5</sup> (±)	Comments
Electrical Simulation of Thermocouple Indicating Devices –  Type B Type C Type E	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C  (0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C  (-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.59 °C 0.49 °C 0.45 °C 0.48 °C  0.43 °C 0.4 °C 0.44 °C 0.63 °C 1.0 °C  0.62 °C 0.3 °C 0.28 °C 0.3 °C 0.45 °C	Fluke 5520A

*Jim C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Simulation of Thermocouple Indicating Devices – (Cont.)			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.33 °C 0.22 °C 0.2 °C 0.23 °C 0.29 °C	Fluke 5520A
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.4 °C 0.24 °C 0.22 °C 0.32 °C 0.48 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.43 °C 0.31 °C 0.21 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.55 °C 0.39 °C 0.36 °C 0.36 °C 0.43 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.67 °C 0.42 °C 0.47 °C 0.48 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.64 °C 0.54 °C 0.55 °C 0.64 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.81 °C 0.44 °C 0.39 °C 0.38 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.65 °C 0.32 °C	

*J. C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Simulation of RTD Indicating Devices –			
Pt 385, 100 Ω	(-200 to -80) °C (-80 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 0.06 °C 0.09 °C 0.11 °C 0.12 °C 0.14 °C 0.27 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.06 °C 0.06 °C 0.09 °C 0.11 °C 0.12 °C 0.14 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.29 °C 0.05 °C 0.06 °C 0.07 °C 0.09 °C 0.09 °C 0.11 °C 0.12 °C 0.27 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.05 °C 0.05 °C 0.06 °C 0.14 °C 0.15 °C 0.16 °C 0.19 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.06 °C 0.06 °C 0.07 °C 0.09 °C 0.09 °C 0.1 °C 0.14 °C	

*J. C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Simulation of RTD Indicating Devices – (Cont.)			
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.1 °C 0.1 °C 0.27 °C	Fluke 5520A
PtNi 385, 120 Ω (Ni120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.1 °C 0.1 °C 0.17 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.35 °C	

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
AC Voltage – Generate			
(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	0.1 % + 6 μV 0.02 % + 6 μV 0.03 % + 6 μV 0.12 % + 6 μV 0.41 % + 12 μV 0.93 % + 50 μV	Fluke 5520A
(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	0.04 % + 8 μV 0.02 % + 8 μV 0.02 % + 8 μV 0.05 % + 8 μV 0.1 % + 32 μV 0.23 % + 70 μV	

*Jim C. Bunt*

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
AC Voltage – Generate (Cont.)			
330 mV to 3.29999 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	0.04 % + 50 µV 0.02 % + 60 µV 0.03 % + 60 µV 0.04 % + 50 µV 0.09 % + 130 µV 0.28 % + 600 µV	Fluke 5520A
(3.3 to 3.29999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.04 % + 650 µV 0.02 % + 600 µV 0.03 % + 600 µV 0.04 % + 600 µV 0.02 % + 1.6 mV	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.03 % + 2 mV 0.03 % + 6 mV 0.03 % + 6 mV 0.04 % + 6 mV 0.23 % + 5 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 10 mV 0.03 % + 10 mV 0.04 % + 10 mV	
AC Voltage – Measure			
(0 to 200) mV	(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	0.02 % + 14 µV 0.02 % + 4 µV 0.02 % + 4 µV 0.02 % + 2 µV 0.02 % + 14 µV 0.04 % + 8 µV 0.09 % + 20 µV	Fluke 8508A
200 mV to 2 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	0.02 % + 120 µV 0.02 % + 20 µV 0.02 % + 20 µV 0.01 % + 20 µV 0.02 % + 20 µV 0.03 % + 20 µV 0.07 % + 0.2 mV 0.35 % + 2 mV 1.2 % + 20 mV	

*J. C. Bunt*



Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
AC Voltage – Measure (Cont.)			
(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	0.02 % + 1.2 mV 0.02 % + 0.2 mV 0.02 % + 0.2 mV 0.01 % + 0.2 mV 0.02 % + 0.2 mV 0.03 % + 0.4 mV 0.07 % + 2 mV 0.35 % + 2 mV 1.2 % + 20 mV	Fluke 8508A
(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	0.02 % + 12 mV 0.02 % + 2 mV 0.02 % + 2 mV 0.01 % + 2 mV 0.02 % + 2 mV 0.03 % + 4 mV 0.07 % + 20 mV 0.35 % + 200 mV	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz	0.02 % + 20 mV 0.03 % + 40 mV 0.07 % + 200 mV	
AC Current – Generate			
(29.00 to 329.99) 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	0.23 % + 0.1 µA 0.17 % + 0.1 µA 0.15 % + 0.1 µA 0.35 % + 0.15 µA 0.93 % + 0.2 µA 1.9 % + 0.4 µA	Fluke 5520A
330 µA to 3.2999 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	0.23 % + 0.15 µA 0.15 % + 0.15 µA 0.12 % + 0.15 µA 0.23 % + 0.2 µA 0.58 % + 0.3 µA 1.7 % + 0.6 µA	

*J. C. Bunt*

Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
AC Current – Generate (Cont.)			
(3.3 to 32.999) 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	0.21 % + 2 µA 0.11 % + 2 µA 0.05 % + 2 µA 0.1 % + 2 µA 0.23 % + 3 µA 0.47 % + 4 µA	Fluke 5520A
(33 to 329.99) 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	0.21 % + 20 µA 0.11 % + 20 µA 0.05 % + 20 µA 0.12 % + 50 µA 0.23 % + 100 µA 0.47 % + 200 µA	
(0.33 to 3.3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.21 % + 100 µA 0.08 % + 100 µA 0.69 % + 1 mA 2.9 % + 5 mA	
(1.1 to 10.9999) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.08 % + 2 mA 0.12 % + 2 mA 3.5 % + 5 mA	
(11 to 20.5) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.14 % + 5 mA 0.18 % + 5 mA 3.5 % + 5 mA	
(20 to 1000) A	(45 to 65) Hz (65 to 440) Hz	0.93 % + 100 mA 0.37 % + 90 mA	
AC Current – Measure			
(0 to 220) µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.04 % + 20 nA 0.04 % + 20 nA 0.09 % + 50 nA	Fluke 8508A
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.04 % + 0.2 µA 0.04 % + 0.2 µA 0.09 % + 2 µA	



Parameter/Range	Frequency	CMC <sup>2,5</sup> (±)	Comments
AC Current – Measure (Cont.)			
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.04 % + 2 µA 0.04 % + 2 µA 0.09 % + 2 µA	Fluke 8508A
(20 to 200) mA	1 Hz to 10 kHz (10 to 30) kHz	0.04 % + 20 µA 0.08 % + 20 µA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz	0.08 % + 200 µA 0.1 % + 200 µA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.11 % + 2 mA 0.3 % + 2 mA	

### III. Fluid Quantities

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Mass Flow Rate – Flow Meter and Flow Controller	(5 to 500) sccm (50 to 5000) sccm (5 to 50 000) sccm	0.41 % 0.18 % 0.22 %	Bios Drycal bench

### IV. Mechanical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Laboratory Balances <sup>3</sup> – Fixed Points			
Resolution:			Performed in accordance with NIST handbook 44 test method:  1 mg to 200 g using ASTM Class 0 weights
0.0001 mg	1 mg	5 µg	
0.0001 mg	2 mg	5 µg	
0.0001 mg	3 mg	5 µg	
0.0001 mg	5 mg	5 µg	
0.0001 mg	10 mg	5 µg	
0.0001 mg	20 mg	5 µg	
0.0001 mg	30 mg	5 µg	
0.0001 mg	50 mg	5 µg	

*Jim C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Laboratory Balances <sup>3</sup> – Fixed Points (Cont.)			
Resolution:			
0.0001 mg	100 mg	5 µg	Performed in accordance with NIST handbook 44 test method:  (300 to 32 000) g using ASTM Class 1 weights
0.0001 mg	200 mg	5 µg	
0.0001 mg	300 mg	5 µg	
0.0001 mg	500 mg	5 µg	
0.000001 g	1 g	17 µg	
0.000001 g	2 g	17 µg	
0.000001 g	3 g	17 µg	
0.000001 g	5 g	17 µg	
0.000001 g	10 g	25 µg	
0.000001 g	20 g	37 µg	
0.000001 g	30 g	37 µg	
0.000001 g	50 g	60 µg	
0.00001 g	100 g	0.13 mg	
0.00001 g	150 g	0.19 mg	
0.00001 g	200 g	0.25 mg	
0.0001 g	300 g	0.87 mg	
0.0001 g	400 g	1.2 mg	
0.0001 g	500 g	1.4 mg	
0.001 g	600 g	1.8 mg	
0.001 g	800 g	2.4 mg	
0.001 g	1000 g	3 mg	
0.001 g	1200 g	3.5 mg	
0.01 g	2000 g	9 mg	
0.01 g	2500 g	10 mg	
0.01 g	3000 g	11 mg	
0.01 g	3500 g	12 mg	
0.01 g	4000 g	14 mg	
0.01 g	4500 g	15 mg	
0.01 g	5000 g	16 mg	
0.01 g	6000 g	18 mg	
0.01 g	8000 g	24 mg	
0.01 g	10 000 g	30 mg	
0.1 g	12 000 g	77 mg	
0.1 g	15 000 g	81 mg	
0.1 g	16 000 g	83 mg	
0.1 g	20 000 g	90 mg	
0.1 g	25 000 g	99 mg	
0.1 g	30 000 g	0.11 g	
0.1 g	32 000 g	0.12 g	

*Jim C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Industrial Scales <sup>3</sup> – Fixed Points			
Resolution:			
0.00001 kg	1 kg	8 mg	Performed in accordance with NIST Handbook 44:  (1 to 300) kg using ASTM Class 1 weights  (300 to 400) kg using ASTM Class 6 and NIST Class F weights
0.00001 kg	2 kg	9 mg	
0.00001 kg	3 kg	11 mg	
0.00002 kg	4 kg	18 mg	
0.00002 kg	5 kg	20 mg	
0.00002 kg	6 kg	22 mg	
0.0001 kg	10 kg	75 mg	
0.0001 kg	15 kg	81 mg	
0.0001 kg	20 kg	90 mg	
0.0001 kg	25 kg	99 mg	
0.0001 kg	30 kg	0.11 g	
0.0001 kg	35 kg	0.12 g	
0.001 kg	40 kg	0.7 g	
0.001 kg	50 kg	0.71 g	
0.001 kg	60 kg	0.71 g	
0.001 kg	75 kg	0.72 g	
0.001 kg	80 kg	0.73 g	
0.001 kg	100 kg	0.75 g	
0.001 kg	120 kg	0.75 g	
0.001 kg	125 kg	0.77 g	
0.001 kg	150 kg	0.81 g	
0.002 kg	200 kg	1.5 g	
0.002 kg	250 kg	1.6 g	
0.002 kg	300 kg	1.7 g	
0.02 kg	400 kg	48 g	
0.02 kg	500 kg	59 g	
0.02 kg	750 kg	88 g	
0.02 kg	1000 kg	0.12 kg	
0.02 kg	1250 kg	0.15 kg	
0.02 kg	1500 kg	0.17 kg	
0.05 kg	2000 kg	0.23 kg	
0.05 kg	2500 kg	0.29 kg	
0.05 kg	3000 kg	0.35 kg	
0.1 kg	3500 kg	0.41 kg	
0.1 kg	4000 kg	0.48 kg	

*J. C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Mass –  Fixed Points	30 kg 25 kg 20 kg 10 kg 5 kg 4 kg 3 kg 2 kg 1 kg 500 g 300 g 200 g 100 g 50 g 30 g 20 g 10 g 5 g 3 g 2 g 1 g 500 mg 300 mg 200 mg 100 mg 50 mg 30 mg 20 mg 10 mg 5 mg 3 mg 2 mg 1 mg	9.7 mg 8.8 mg 7.9 mg 1.9 mg 0.9 mg 1.0 mg 0.9 mg 0.7 mg 0.1 mg 0.1 mg 0.06 mg 32 µg 22 µg 13 µg 9 µg 12 µg 10 µg 5.6 µg 2.4 µg 1.8 µg 1.4 µg 1.4 µg 1.4 µg 0.9 µg 1 µg 1 µg 1.1 µg 1 µg 1 µg 0.8 µg 0.6 µg 0.6 µg 0.7 µg	Performed in accordance with NISTIR 6969 SOP 5 & SOP 4 for ASTM Class 1 and 2 and NISTR 6969 SOP 7 for ASTM Class 3 and 4.
Pressure – Transfer Standards and Pressure Devices	(1 to 50) psia	$8.3 \times 10^{-5}$ psi	DHI PG7601
Pressure – Absolute, Gauge, and Gas	(50 to 1000) psia	$3.7 \times 10^{-3}$ psi	DHI PG7601
Pressure Devices <sup>3</sup> –  Gas	(1 to 30) inH <sub>2</sub> O	0.013 inH <sub>2</sub> O	DHI PPC3

*John C. Bunt*

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Pressure Devices <sup>3</sup> – (Cont.)			
Gas, Absolute and Gauge	(1 to 30) psia (30 to 300) psia (300 to 500) psia (500 to 1000) psia	1.4 x 10 <sup>-3</sup> psi 0.025 psi 0.075 psi 0.11 psi	DHI PPC3, DHI RPM4
Oil, Absolute and Gauge	(1000 to 1500) psia (1500 to 5000) psia (5000 to 10 000) psia	0.7 psi 1.3 psi 1.8 psi	DHI RPM4
Volume – Pipettes <sup>3</sup>	(0.1 to 1) µL (2 to 5) µL (6 to 20) µL	4.1 % 1.4 % 1.7 %	Photometric methods
6 Digit Balances	(1 to 5) µL (6 to 10) µL (11 to 20) µL	0.07 µL 0.08 µL 0.12 µL	Gravimetric methods, 6 digit balances
5 Digit Balances	(10 to 40) µL (41 to 100) µL (101 to 200) µL (201 to 500) µL (501 to 1000) µL (1001 to 2500) µL (2501 to 5000) µL (5001 to 10 000) µL	0.23 µL 0.18 µL 0.3 µL 0.91 µL 1.5 µL 5.8 µL 6.4 µL 5.5 µL	Gravimetric methods, 5 digit balances

#### V. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Relative Humidity – Measuring Equipment <sup>3</sup>	10 % RH 20 % RH 50 % RH 80 % RH 95 % RH	0.52 % RH 0.56 % RH 0.78 % RH 1.1 % RH 1.3 % RH	Thunder Scientific 2500ST-LT

*J. C. Bunt*

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature – Thermometers and Probes <sup>3</sup>	(-80 to -30) °C	16 mK	Comparison in liquid bath with SPRT
	(-30 to 300) °C	11 mK	Comparison in liquid and metal block bath with SPRT
	(300 to 660) °C	62 mK	SPRT with dry block
	(660 to 1200) °C	1.6 °C	TC with dry block
Temperature – Thermometers and Probes  Fixed Points	-195.798 °C -38.8344 °C 0.01 °C 29.7646 °C 156.598 °C 231.928 °C 419.527 °C 660.323 °C	3.7 mK 2.3 mK 1.8 mK 3.1 mK 3.2 mK 3.1 mK 4.7 mK 7.9 mK	Liquid N <sub>2</sub> comparison Mercury cell Water triple point cell Gallium cell Indium cell Tin cell Zinc cell Aluminum cell

## VI. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Frequency – Measure	10 MHz	$5.8 \times 10^{-10}$ Hz/Hz	Spectracom GPS master oscillator
Frequency – Measuring Equipment	(0 to 2) MHz	$1.2 \times 10^{-11}$ Hz/Hz + 5 µHz	Fluke 5520A w/ext 10 MHz reference
Stopwatch	(0 to 86 400) s/day	0.059 s/day	Virograf timometer

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





- <sup>2</sup> 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.
- <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, percentages are percentage of reading, unless otherwise indicated.
- <sup>5</sup> 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. CMCs are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.





## Accredited Laboratory

A2LA has accredited

**ATLANTIC SCALE COMPANY, INC.**

*Nutley, NJ*

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 R205 – Specific Requirements: Calibration Laboratory Accreditation Program and the requirements of ANSI/NCSLI Z540-1-1994. 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 8<sup>th</sup> day of September 2016.



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

Senior Director of Quality and Communications  
For the Accreditation Council  
Certificate Number 2736.01  
Valid to August 31, 2018

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