



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

PRECISION MEASUREMENTS

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CALIBRATION

Valid To: October 31, 2024

Certificate Number: 7185.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations and dimensional inspections^{1, 6}:

I. Chemical

Parameter/Equipment	Range	CMC ^{2, 7} (±)	Comments
Conductivity ³ – Measuring Equipment	100 µS/cm 1413 µS/cm 5000 µS/cm 10 000 µS/cm 100 000 µS/cm	2.9 µS/cm 11 µS/cm 36 µS/cm 57 µS/cm 730 µS/cm	Conductivity Solutions QAI-A02

III. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Outside Micrometers ³	(0.05 to 4) in (4 to 40) in	(60 + 520L) µin (730 + 180L) µin	Gage blocks QAI-MXX procedures
Height Gages ³	(0.05 to 4) in (4 to 40) in	(86 + 520L) µin (360 + 1800L) µin	Gage blocks QAI-MXX procedures

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Depth Gages ³	(0.05 to 4) in	(180 + 520L) μin	Gage blocks QAI-MXX procedures
Calipers ³	(0.05 to 4) in (4 to 40) in	(310 + 520L) μin (730 + 180L) μin	Gage blocks QAI-MXX procedures
Dial Indicators ³	(0.0005 to 4) in	(36 + 520L) μin	Gage blocks QAI-MXX procedures
Ring Gauge – Inside Diameter	(0.65 to 1.2) in	(8.2 + 0.71L) μin	Ga ring gages P&W Labmaster P&W manual
Gauge Blocks	(0.05 to 4) in (4 to 8) in	(3.7 + 1.3L) μin (13 + 1.3L) μin	Gage blocks P&W Labmaster NIST Monograph 180
Graduated Linear Devices ³	Up to 39 in (30 to 78) in	(5000 + 1.4L) μin	Pi Tapes QAI-M18
Pin/Plug Gages	(0.010 to 1) in	(18 + 22L) μin	Universal measuring device gage blocks QAI-M10

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature Calibration, Indication, & Control Equipment ³ Used with Thermocouple			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.56 °C 0.19 °C 0.17 °C 0.19 °C 0.24 °C	Fluke 5520A electrical simulation of thermocouple output; GIDEP procedures OEM procedures
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.31 °C 0.19 °C 0.17 °C 0.20 °C 0.26 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.37 °C 0.21 °C 0.19 °C 0.29 °C 0.45 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.45 °C 0.25 °C 0.22 °C 0.21 °C 0.31 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.63 °C 0.39 °C 0.37 °C 0.45 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.52 °C 0.40 °C 0.41 °C 0.51 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.7 °C 0.27 °C 0.19 °C 0.17 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature Calibration, Indication & Control Equipment Used with RTD ³			
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	0.05 °C 0.05 °C 0.04 °C 0.08 °C 0.09 °C 0.11 °C 0.19 °C	Fluke 5520A electrical simulation of RTD output; GIDEP procedures, OEM procedures
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	0.04 °C 0.04 °C 0.04 °C 0.05 °C 0.1 °C 0.1 °C 0.12 °C 0.13 °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	0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.07 °C 0.08 °C 0.1 °C	
Pt 385, 1 kΩ	(0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.06 °C 0.06 °C 0.07 °C 0.19 °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	0.2 °C 0.05 °C 0.05 °C 0.07 °C 0.07 °C 0.08 °C 0.09 °C 0.1 °C 0.2 °C	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Temperature Calibration, Indication & Control Equipment used with RTD ³ (cont)			
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 0.07 °C 0.09 °C 0.09 °C 0.11 °C	Fluke 5520A, electrical simulation of RTD output; GIDEP procedures, OEM procedures
Ni 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.07 °C 0.07 °C 0.12 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.4 °C	
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (33 to 330) V (330 to 1000) V	20 μV/V + 1.8 μV 11 μV/V + 11 μV 11 μV/V + 23 μV 18 μV/V + 1.1 mV 18 μV/V + 4 mV	Fluke 5520A QAI-EXX procedures OEM procedures
DC Voltage – Measure ³	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1 to 10) kV (10 to 40) kV	6.3 μV/V + 0.5 μV 3.7 μV/V + 0.3 μV 3.7 μV/V + 1 μV 5.8 μV/V + 10 μV 5.9 μV/V + 0.1 mV 0.4 mV/V + 40 mV 27 mV/V + 0.1 V	Fluke 8508A QAI-EXX procedures OEM procedures Vitretek 4700 QAI-EXX procedures OEM procedures Fluke 87V with 80K- 40 QAI-EXX procedures OEM procedures

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
DC Current – Generate ³	Up to 330 μ A 330 μ A 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 20.5) A	120 μ A/A + 16 nA 78 μ A/A + 60 nA 78 μ A/A + 0.5 μ A 78 μ A/A + 10 μ A 160 μ A/A + 40 μ A 300 μ A/A + 0.23 mA 390 μ A/A + 0.9 mA 780 μ A/A + 2.5 mA	Fluke 5520A QAI-EXX procedures OEM procedures
DC Current – Measure ³	100 μ A to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A	14 μ A/A + 4.1 nA 15 μ A/A + 41 nA 52 μ A/A + 0.81 μ A 190 μ A/A + 17 μ A 410 μ A/A + 0.4 mA	Fluke 8508A QAI-EXX procedures OEM procedures
Resistance – Generate ³	Up 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 330 M Ω to 1.1 G Ω	32 $\mu\Omega/\Omega$ + 0.8 m Ω 24 $\mu\Omega/\Omega$ + 1.3 m Ω 22 $\mu\Omega/\Omega$ + 1.3 m Ω 22 $\mu\Omega/\Omega$ + 2.9 m Ω 22 $\mu\Omega/\Omega$ + 7 m Ω 22 $\mu\Omega/\Omega$ + 42 m Ω 22 $\mu\Omega/\Omega$ + 0.12 Ω 22 $\mu\Omega/\Omega$ + 0.42 Ω 22 $\mu\Omega/\Omega$ + 1.2 Ω 25 $\mu\Omega/\Omega$ + 3.3 Ω 25 $\mu\Omega/\Omega$ + 11 Ω 47 $\mu\Omega/\Omega$ + 48 Ω 110 $\mu\Omega/\Omega$ + 0.27 k Ω 200 $\mu\Omega/\Omega$ + 3.2 k Ω 390 $\mu\Omega/\Omega$ + 19 k Ω 2.4 m Ω/Ω + 0.11 M Ω 12 m Ω/Ω + 1.1 M Ω	

Parameter/Equipment	Range	CMC ^{2, 5} (\pm)	Comments
Resistance – Measure ³	15 $\mu\Omega$ to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 k Ω (2 to 20) k Ω (20 to 200) k Ω 200 k Ω to 2 M Ω (2 to 20) M Ω (20 to 200) M Ω 200 M Ω to 2 G Ω (2 to 20) G Ω	20 $\mu\Omega/\Omega$ + 4 $\mu\Omega$ 11 $\mu\Omega/\Omega$ + 15 $\mu\Omega$ 8.5 $\mu\Omega/\Omega$ + 51 $\mu\Omega$ 8.3 $\mu\Omega/\Omega$ + 510 $\mu\Omega$ 8.2 $\mu\Omega/\Omega$ + 5.1 m Ω 8.6 $\mu\Omega/\Omega$ + 51 m Ω 11 $\mu\Omega/\Omega$ + 1 Ω 20 $\mu\Omega/\Omega$ + 10 Ω 66 $\mu\Omega/\Omega$ + 1 k Ω 190 $\mu\Omega/\Omega$ + 0.1 M Ω 1.6 m Ω/Ω + 1 M Ω	Fluke 8508A QAI-EXX procedures OEM procedures
Capacitance – Generate ³	(0.19 to 0.4) nF (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 330 nF to 1.1 μ F (1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F (110 to 330) μ F 330 μ F to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	3.9 mF/F + 8.1 pF 3.9 mF/F + 8.2 pF 3.9 mF/F + 8.7 pF 2 mF/F + 11 pF 2 mF/F + 81 pF 2 mF/F + 0.11 nF 2 mF/F + 0.32 nF 2 mF/F + 1.1 nF 2 mF/F + 3.2 nF 2 mF/F + 13 nF 3.2 mF/F + 37 nF 3.5 mF/F + 0.16 μ F 3.5 mF/F + 0.45 μ F 3.5 mF/F + 1.1 μ F 3.5 mF/F + 2.6 μ F 3.5 mF/F + 8.3 μ F 5.9 mF/F + 25 μ F 8.6 mF/F + 90 μ F	Fluke 5520A QAI-EXX procedures OEM procedures
Capacitance – Measure ³	(1 to 10) pF (10 to 100) pF (0.1 to 1) nF (1 to 10) nF (10 to 100) nF (0.1 to 1) μ F (1 to 10) μ F (10 to 100) μ F (0.1 to 1) mF	1 mF/F + 7.8 fF 1 mF/F + 95 fF 1 mF/F + 0.6 pF 1 mF/F + 7.7 pF 1 mF/F + 77 pF 1 mF/F + 1.3 nF 1 mF/F + 13 nF 1 mF/F + 0.13 μ F 1 mF/F + 1.3 μ F	Fluke PM6304 QAI-EXX procedures OEM procedures

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Inductance – Measure ³	(0.1 to 1) mH (1 to 10) mH (10 to 100) mH (0.1 to 1) H (1 to 10) H (10 to 100) H (0.1 to 1) kH	1 mH/H + 1.5 µH 1 mH/H + 15 µH 1 mH/H + 0.15 mH 1 mH/H + 1.4 mH 1 mH/H + 15 mH 1 mH/H + 0.17 H 5 mH/H + 1.9 H	Fluke PM6304 QAI-EXX procedures OEM procedures

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage –Measure ³			
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	160 µV/V + 120 µV 130 µV/V + 21 µV 110 µV/V + 21 µV 80 µV/V + 21 µV 120 µV/V + 21 µV 230 µV/V + 41 µV 600 µV/V + 210 µV 3.1 mV/V + 2.1 mV 11 mV/V + 20 mV	Fluke 8508A QAI-EXX procedures OEM procedures
(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	160 µV/V + 1.3 mV 130 µV/V + 210 µV 97 µV/V + 210 µV 81 µV/V + 210 µV 120 µV/V + 210 µV 230 µV/V + 410 µV 580 µV/V + 2.1 mV 3.1 mV/V + 20 mV 11 mV/V + 0.2 V	
(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	160 µV/V + 13 mV 130 µV/V + 2.1 mV 97 µV/V + 2.1 mV 79 µV/V + 2.1 mV 120 µV/V + 2.1 mV 230 µV/V + 4.1 mV 580 µV/V + 21 mV 3.1 mV/V + 200 mV 11 mV/V + 2 V	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Voltage – Measure ³ (cont)			
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	1.6 mV/V + 71 mV 130 µV/V + 21 mV 170 µV/V + 21 mV 400 µV/V + 41 mV 670 µV/V + 0.2 V	Fluke 8508A QAI-EXX procedures OEM procedures
(1 to 10) kV	10 mHz to 10 Hz (10 to 65) Hz (65 to 200) Hz (200 to 450) Hz	1.4 mV/V + 0.2 V 1.4 mV/V + 0.2 V 1.4 mV/V + 0.2 V 4.7 mV/V + 0.2 V	Vitrek 4700 QAI-EXX procedures OEM procedures
AC Current – Measure ³			
20 µA to 200 µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	510 µA/A + 20 nA 560 µA/A + 20 nA 750 µA/A + 20 nA 4.1 mA/A + 20 nA	Fluke 8508A QAI-EXX procedures OEM procedures
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	340 µA/A + 0.2 µA 320 µA/A + 0.2 µA 720 µA/A + 0.2 µA 4.1 mA/A + 0.2 µA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	340 µA/A + 2 µA 340 µA/A + 2 µA 730 µA/A + 2 µA 4.1 mA/A + 2 µA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	340 µA/A + 20 µA 320 µA/A + 20 µA 640 µA/A + 20 µA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	630 µA/A + 0.2 mA 940 µA/A + 0.2 mA 3.1 mA/A + 0.2 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	830 µA/A + 2 mA 2.7 mA/A + 2 mA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current – Generate ³			
(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	1.6 mA/A + 90 nA 1.2 mA/A + 90 nA 980 µA/A + 90 nA 2.4 mA/A + 140 nA 6.3 mA/A + 180 nA 13 mA/A + 370 nA	Fluke 5520A QAI-EXX procedures OEM procedures
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	1.6 mA/A + 0.4 µA 980 µA/A + 0.4 µA 780 µA/A + 0.3 µA 1.6 mA/A + 0.4 µA 3.9 mA/A + 0.5 µA 7.8 mA/A + 0.8 µA	
(3.3 to 33) 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	1.4 mA/A + 6 µA 0.7 mA/A + 6 µA 320 µA/A + 4 µA 630 µA/A + 4 µA 1.6 mA/A + 5 µA 3.2 mA/A + 7 µA	
(33 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	1.4 mA/A + 50 µA 0.7 mA/A + 50 µA 320 µA/A + 30 µA 770 µA/A + 50 µA 1.6 mA/A + 90 µA 2.4 mA/A + 170 µA	
(330 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.4 mA/A + 170 µA 390 µA/A + 120 µA 4.7 mA/A + 820 µA 20 mA/A + 4 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.4 mA/A + 450 µA 470 µA/A + 280 µA 4.7 mA/A + 830 µA 20 mA/A + 3.9 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	470 µA/A + 2.5 mA 780 µA/A + 2 mA 24 mA/A + 7.3 mA	
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	940 µA/A + 5.9 mA 1.2 mA/A + 5.9 mA 24 mA/A + 28 mA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Oscilloscopes ³ –			
Levelled Sine Wave			
Amplitude 5 mVp-p to 5 Vp-p	50 kHz	20 mV/V + 0.3 mV	
Flatness (Relative to 50 kHz, Reference) 5 mVp-p to 5 Vp-p	50 kHz to 100 MHz	15 mV/V + 0.1 mV	
	(100 to 300) MHz	20 mV/V + 0.1 mV	
	(300 to 600) MHz	40 mV/V + 0.1 mV	
	600 MHz to 1.1 GHz	76 mV/V + 440 µV	
Square, Sine & Triangle Wave			
Terminated into 1 MΩ 1.8 mV to 5.5 Vp-p	10 Hz to 100 kHz	30 mV/V + 0.1 mV	
Terminated into 50 Ω 1.8 mV to 2.5 Vp-p	10 Hz to 100 kHz	30 mV/V + 0.1 mV	
Time Marker Output 2 ns to 20 ms	10 Hz to 100 kHz	2.5 µs/s	
AC Voltage – Generate ³			
(1 to 33) mV	(10 to 45) Hz	630 µV/V + 10 µV	Fluke 5520A QAI-EXX procedures GIDEP procedures OEM procedures
	45 Hz to 10 kHz	120 µV/V + 6 µV	
	(10 to 20) kHz	160 µV/V + 6 µV	
	(20 to 50) kHz	780 µV/V + 8 µV	
	(50 to 100) kHz	2.8 mV/V + 14 µV	
	(100 to 500) kHz	6.3 mV/V + 48 µV	
(33 to 330) mV	(10 to 45) Hz	240 µV/V + 59 µV	
	45 Hz to 10 kHz	120 µV/V + 13 µV	
	(10 to 20) kHz	130 µV/V + 13 µV	
	(20 to 50) kHz	280 µV/V + 18 µV	
	(50 to 100) kHz	630 µV/V + 35 µV	
	(100 to 500) kHz	1.6 mV/V + 110 µV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage – Generate ³ (cont)			
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	240 µV/V + 550 µV 120 µV/V + 90 µV 150 µV/V + 90 µV 240 µV/V + 170 µV 550 µV/V + 270 µV 1.9 mV/V + 1.3 mV	Fluke 5520A QAI-EXX procedures GIDEP procedures OEM procedures
(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	240 µV/V + 5.5 mV 120 µV/V + 1 mV 190 µV/V + 1 mV 280 µV/V + 1.7 mV 0.7 mV/V + 3 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	150 µV/V + 12 mV 160 µV/V + 13 mV 0.2 mV/V + 13 mV 240 µV/V + 35 mV 1.6 mV/V + 140 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	240 µV/V + 40 mV 200 µV/V + 40 mV 240 µV/V + 40 mV	

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
<p>RF Power – Generate³</p> <p>4 nW to 100 mW</p> <p>1 pW to 10 mW 100 μW to 100 mW 100 pW to 100 μW (1 to 100) pW 100 pW to 100 mW (1 to 100) pW</p> <p>10 μW to 1 W 100 pW to 10 μW</p>	<p>1 mHz to 100 kHz 100 kHz to 10 MHz</p> <p>10 MHz to 2 GHz (2 to 20) GHz (2 to 20) GHz (2 to 20) GHz (20 to 31.8) GHz (20 to 31.8) GHz</p> <p>100 kHz to 26.5 GHz 10 MHz to 18 GHz</p>	<p>48 mW/W 150 mW/W</p> <p>210 mW/W 210 mW/W 240 mW/W 260 mW/W 260 mW/W 590 mW/W</p> <p>35 mW/W 46 mW/W</p>	<p>GIDEP procedures OEM procedures</p> <p>Hewlett Packard 3325B</p> <p>Agilent E8257D</p> <p>Hewlett Packard 8481D Agilent E4416A N8482A N8481A 8485A</p>
<p>RF Attenuation³ – Measure (TRFL)</p> <p>100 μW to 1 mW (10 to 100) μW (1 to 10) μW 100 nW to 1 μW (10 to 100) nW (1 to 10) nW 100 pW to 1 nW (10 to 100) pW (1 to 10) pW 100 fW to 1 pW</p> <p>100 μW to 1 mW (10 to 100) μW (1 to 10) μW 100 nW to 1 μW (10 to 100) nW (1 to 10) nW 100 pW to 1 nW (10 to 100) pW (1 to 10) pW 100 fW to 1 pW</p>	<p>2.5 MHz to 1.3 GHz (200 Hz BW)</p> <p>1.3 GHz to 26.5 GHz (200 Hz BW)</p>	<p>12 mW/W 17 mW/W 21 mW/W 26 mW/W 40 mW/W 45 mW/W 50 mW/W 55 mW/W 70 mW/W 74 mW/W</p> <p>12 mW 17 mW/W 21 mW/W 26 mW/W 40 mW/W 45 mW/W 50 mW/W 55 mW/W 120 mW/W 120 mW/W</p>	<p>Hewlett Packard 8902A GIDEP procedures OEM procedures</p>

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
Phase Modulation	150 kHz to 10 MHz 10 MHz to 1.3 GHz (1.3 to 26.5) GHz	4 % of reading + 0.5 rad 3 % of reading + 0.5 rad 4 % of reading + 0.5 rad	Hewlett Packard 8902A GIDEP procedures OEM procedures
Amplitude Modulation – Depths: 5 % to 99 % Depths: to 99 % Depths: 5 % to 99 % Depths: to 99 % Depths: 5 % to 99 % Depths: to 99 %	150 kHz to 10 MHz 150 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz (1.3 to 26.5) GHz (1.3 to 26.5) GHz	2.1 % of reading + 0.012 % AM 3.1 % of reading + 0.012 % AM 1.1 % of reading + 0.012 % AM 3.1 % of reading + 0.012 % AM 2.1 % of reading + 0.012 % AM 3.1 % of reading + 0.012 % AM	Hewlett Packard 8902A GIDEP procedures OEM procedures
Frequency Modulation – Rate: 20 Hz to 200 kHz Rate: 50 Hz to 100 kHz Rate: 20 Hz to 200 kHz Rate: 50 Hz to 100 kHz	250 kHz to 10 MHz 10 MHz to 1.3 GHz 10 MHz to 1.3 GHz (1.3 to 26.5) GHz (1.3 to 26.5) GHz	20 mHz/Hz + 0.12 kHz 51 mHz/Hz + 20 Hz 11 mHz/Hz + 20 Hz 51 mHz/Hz + 20 Hz 11 mHz/Hz + 20 Hz	Hewlett Packard 8902A GIDEP procedures OEM procedures

V. Fluid Quantities

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Liquid Flow – Measuring Equipment ³	Up to 80 gal/min (80 to 800) gal/min	0.31 % of reading + 0.023 gal/min 0.19 % of reading + 0.016 gal/min	Micro Motion DSH100H134P DS300S155 GIDEP procedures OEM procedures

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Gas Flow – Measuring Equipment	(1 to 10) SCCM (10 to 100) SCCM (100 to 1000) SCCM (1 to 10) SLPM (2.5 to 25) SLPM (10 to 100) SLPM (50 to 500) SLPM	0.4 % of reading + 0.000 58 SCCM 0.4 % of reading + 0.0058 SCCM 0.4 % of reading + 0.058 SCCM 0.4 % of reading + 0.58 SCCM 0.47 % of reading + 5.8 SCCM 0.5 % of reading + 5.8 SCCM 0.47 % of reading + 15 SCCM	Fluke MolBloc system GIDEP procedures OEM procedures

VI. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Scales & Balances ³	(1 to 500) mg 1 g to 1 kg (1 to 10) kg (1 to 1000) lb	5.8 µg/g + 5.9 µg 2.1 µg/g + 64 µg 3.3 µg/g + 23 mg 0.012 % of reading + 0.2 lb	Class 1 Weights QAI-A04 Class F Weights NIST HB 44
Load Cells/Force Gauges ³	(1 to 600) lbf	0.0013 % of reading + 0.0066 lbf	Class F Weights QAI-M11
Load Cells ³ (Tension, Compression)	(500 to 5000) N (200 to 2) N (20 to 1779) N	2.4 mN/N 5 mN/N 5 mN/N	Class F Weights QAI-M11

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Mass	(1 to 500) mg 500 mg to 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg Up to 50 lb	3.4 µg 3.4 µg 6.8 µg 8.7 µg 16 µg 31 µg 150 µg 220 µg 330 µg 0.21 g	Class 0 Weights Sartorius CCE106 CCE1004 OIML R111 (ABBA) Class 1 Weights Mettler XS32001L QAI-M17
Pressure – Measuring Equipment ³	(-15 to 25) psig (25 to 500) psig Up to 40 psia (40 to 515) psia (100 to 2000) psig (200 to 10 000) psig (-1 to 1) inH ₂ O (-10 to 10) inH ₂ O	0.008 % of reading + 0.0016 psig 0.01 % of reading + 0.0009 psig 0.008 % of reading + 0.0016 psia 0.01 % of reading + 0.0009 psia 0.008 % of reading + 0.064 psig 0.000 83 % of reading + 0.006 psig 0.0016 inH ₂ O 0.012 inH ₂ O	Ruska 7250xi QAI-P01 Ruska 7250 QAI-P01 Druck P3114-3 QAI-P01 Additel ADT761-LLP QAI-P01
Torque – Measuring Equipment ³	(1 to 100) lbf·in (0.2 to 1000) lbf·ft	0.011 % of reading + 0.000 58 lbf·in 0.011 % of reading + 0.0058 lbf·ft	Class F Weights torque arm GIDEP procedures

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Torque – Measure ³	(2 to 20) ozf·in	0.63 % of reading + 0.001 ozf·in	Mountz BMX20Z
	(1 to 10) lbf·in	0.63 % of reading + 0.001 lbf·in	BMX10i
	(25 to 250) lbf·in	0.6 % of reading + 0.01 lbf·in	BMX250i
	(10 to 100) lbf·ft	0.63 % of reading + 0.0058 lbf·ft	BMX100F
	(25 to 250) lbf·ft	0.7 % of reading + 0.01 lbf·ft	BMX 250F QAI – M04
Torque – Measure	(10 to 100) lbf·in	0.12 % of reading + 0.02 lbf·in	AKO TDS QAI – M04
	(100 to 1000) lbf·ft	0.12 % of reading + 0.2 lbf·ft	

VII. Thermodynamics

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Temperature measurement with RTD ³	-196 °C	0.04 °C	Kaye IRTD Liquid nitrogen Dry ice Temperature baths QAI-T01
	-80 °C	0.04 °C	
	(-40 to 125) °C	0.04 °C	
	(125 to 300) °C	0.04 °C	
Relative Humidity ³	(0 to 25) % RH	1.3 % RH	Edgetech RH-Cal QAI-T10
	(25 to 75) % RH	0.77 % RH	
	(75 to 95) % RH	1.3 % RH	
	(10 to 95) % RH	0.54 % RH	Thunder Scientific 2500 QAI-T08
Liquid-In-Glass Thermometers	(-40 to 125) °C	0.07 °C	Kaye IRTD temperature bath QAI-T02
	(125 to 300) °C	0.07 °C	

Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
Infrared Temperature ³	(20 to 500) °C	0.55 % of reading + 0.074 °C	Fluke 4181 QAI-T07

VIII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
Frequency – Measuring Equipment ³	10 mHz to 120 Hz 120 Hz to 1.2 kHz (1.2 to 12) kHz (12 to 120) kHz 120 kHz to 1.2 MHz (1.2 to 2) MHz	2.5 μ Hz/Hz + 10 mHz 2.5 μ Hz/Hz + 0.1 Hz 2.5 μ Hz/Hz + 1 Hz 2.5 μ Hz/Hz + 10 Hz 2.5 μ Hz/Hz + 0.1 kHz 2.5 μ Hz/Hz + 1 kHz	Fluke 5520A GIDEP procedures OEM procedures
Frequency – Measure ³	(1 to 100) Hz 100 Hz to 1 kHz (1 to 10) kHz (10 to 100) kHz 100 kHz to 1 MHz (1 to 10) MHz (10 to 100) MHz 100 MHz to 1 GHz (1 to 3) GHz	0.6 nHz 51 nHz 760 nHz 5.1 μ Hz 51 μ Hz 510 μ Hz 5.1 mHz 51 mHz 110 mHz	Agilent 53132A GIDEP procedures OEM procedures
Stopwatch / Period ³	Up to 100 s/d	0.051 s/d	Helmut Klein 4500QAI-K01
Rotating Motion ³	(9 to 90 000) rpm	0.0006 % of reading + 0.000 07 rpm	Hewlett Packard 3325B GIDEP procedures OEM procedures
Period Totalization ³	Up to 3600 s	11 μ s/s + 8.2 ms	Control Company 1051 GIDEP procedures OEM procedures

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. 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 In the statement of CMC, L is the length of the unit under test in inches.
- 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's are expressed as either a specific value that covers the full range or as a percent or 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

PRECISION MEASUREMENTS

West Chester, PA

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 9th day of October 2023.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7185.01
Valid to October 31, 2024

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