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

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CALIBRATION

Valid To: September 30, 2021 Certificate Number: 1395.18

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1, 9]:

I. Chemical

Parameter/Equipment	Range	CMC[2, 10] (±)	Comments
Conductivity, Fixed Points – Measuring Equipment	10 µS 100 µS 1000 µS 1408 µS	0.57 µS 2.4 µS 9 µS 11 µS	Reference solutions

II. Dimensional

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Micrometers[3] –			
Linearity	Up to 40 in	(7.8*L* + 52 µin)	Gage blocks
Flatness	0.001 in	5.4 µin	Optical flats
Parallelism	0.001 in	16 µin	Optical parallels

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Calipers[3] –			
Outside Jaws, Step and Depth	Up to 40 in	(8*L* + 430 µin + 0.6*R*)	Gage blocks
Inside Jaws	1 in	(550 µin + 0.6*R*)	Ring gage
Pin Gages	Up to 1.18 in	35 µin	Lasermic

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 6, 8] (±)	Comments
DC Voltage – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	9.1 µV/V + 1.3 µV 7.2 µV/V + 1.6 µV 7 µV/V + 4 µV 7 µV/V + 7.2 µV 8 µV/V + 85 µV 9 µV/V + 0.56 mV	Fluke 5700A
DC Voltage – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V*	7.7 µV/V + 0.44 µV 6.1 µV/V + 0.64 µV 5.8 µV/V + 2.1 µV 8.4 µV/V + 47 µV 8.4 µV/V + 2.2 mV*	HP 3458A OPT-2 *add 12 $(V_{in}/1000)^2$ ppm to all $V_{in} > 100$
DC Current – Generate	(0 to 220) µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 3) A (3 to 11) A (11 to 20.5) A	42 µA/A + 0.01 µA 47 µA/A + 0.01 µA 46 µA/A + 0.10 µA 54 µA/A + 1.0 µA 120 µA/A + 30 µA 440 µA/A + 40 µA 590 µA/A + 500 µA 0.12 % + 750 µA *****	Fluke 5700A *Specifications apply within 2 minutes of selecting “operate”

Parameter/Equipment	Range	CMC[2, 5, 6, 8] (±)	Comments
DC Current – Measure	(0 to 1) µA (1 to 10) µA (10 to 100) µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 3) A (3 to 100) A (100 to 200) A	62 µA/A + 45 pA 32 µA/A + 110 pA 36 µA/A + 900 pA 30 µA/A + 6 nA 70 µA/A + 60 nA 55 µA/A + 600 nA 0.015 % + 12 µA 0.15 % 0.42 % 0.26 %	HP 3458A OPT-2 HP 3458A HP 34401A HP 3458A w/DC shunt
Resistance – Generate, Fixed Points	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	111 µΩ/Ω 110 µΩ/Ω 34 µΩ/Ω 33 µΩ/Ω 21 µΩ/Ω 21 µΩ/Ω 17 µΩ/kΩ 17 µΩ/kΩ 15 µΩ/kΩ 15 µΩ/kΩ 18 µΩ/kΩ 36 µΩ/kΩ 25 µΩ/MΩ 29 µΩ/MΩ 50 µΩ/MΩ 74 µΩ/MΩ 0.025 %	Fluke 5700A
Resistance[3] – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 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 (0.33 to 1.1) MΩ (1.1 to 3.3) MΩ	63 µΩ/Ω + 1.0 mΩ 48 µΩ/Ω + 1.5 mΩ 34 µΩ/Ω + 1.4 mΩ 33 µΩ/Ω + 2.0 mΩ 51 µΩ/Ω + 2.0 mΩ 18 µΩ/Ω + 0.02 Ω 32 µΩ/Ω + 0.02 Ω 33 µΩ/Ω + 0.2 Ω 32 µΩ/Ω + 0.2 Ω 38 µΩ/Ω + 2 Ω 38 µΩ/Ω + 2 Ω 78 µΩ/Ω + 30 Ω	Fluke 5520A/SC1100 CMC's shown are based on 4-wire compensation only; for 2-wire and 2-wire compensation add 5 µV per ampere stimulus current. (R_{floor} = E/I)

Parameter/Equipment	Range	CMC[2, 5, 6, 8] (±)	Comments
Resistance[3] – Generate (cont)	(3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 323) MΩ (0.11 to 1.1) GΩ	0.015 % + 50 Ω 0.037 % + 2.5 kΩ 0.086 % + 3 kΩ 0.41 % + 0.1 MΩ 1.9 % + 1 MΩ	Fluke 5520A/SC1100 CMC's shown are based on 4-wire compensation only; for 2-wire and 2-wire compensation add 5 μV per ampere stimulus current. (R_{floor} = E/I)
Resistance[3] – Measure	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1000) MΩ	24 μΩ/Ω + 50 μΩ 22 μΩ/Ω + 0.5 mΩ 14 μΩ/Ω + 0.5 mΩ 16 μΩ/Ω + 5 mΩ 17 μΩ/Ω + 50 mΩ 21 μΩ/Ω + 2 Ω 82 μΩ/Ω + 100 Ω 0.083 % + 1 kΩ 0.89 % + 10 kΩ	HP 3458A OPT-2 Within ±1 °C of last ACAL and ±5 °C of T_{CAL}
Electrical Simulation of Thermocouples[3] –			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °C 0.13 °C 0.12 °C 0.13 °C 0.17 °C	Fluke 5520A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.21 °C 0.13 °C 0.12 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.15 °C 0.13 °C 0.21 °C 0.31 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.19 °C 0.13 °C 0.12 °C	

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Electrical Simulation of RTD[3] –			
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	0.19 ºC 0.03 ºC 0.039 ºC 0.047 ºC 0.054 ºC 0.062 ºC 0.07 ºC 0.078 ºC 0.18 ºC	Fluke 5520A
PT 385, 100 Ω	(-200 to 0) ºC (0 to 100) ºC (100 to 300) ºC (300 to 400) ºC (400 to 630) ºC (630 to 800) ºC	0.039 ºC 0.054 ºC 0.07 ºC 0.078 ºC 0.093 ºC 0.18 ºC	
Oscilloscopes[3] –			
Amplitude – DC Signal 50 Ω Load 1 MΩ Load	 1 mV to 6.6 V 1 mV to 130 V	 0.29 % + 40 µV 0.07 % + 40 µV	Fluke 5520A/SC1100
Amplitude – Square Wave 50 Ω Load	1 mV_{p-p} to 6.6 V_{p-p} 10 Hz to 100 kHz	 0.29 % + 40 µV	
1 MΩ Load	1 mV_{p-p} to 130 V_{p-p} 10 Hz to 100 kHz	 0.12 % + 40 µV	
Bandwidth	5 mV_{p-p} to 5.5 V_{p-p} 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	 2.4 % + 300 µV 3.9 % + 100 µV 4.2 % + 100 µV 5.8 % + 100 µV	
	5 mV_{p-p} to 3.5 V_{p-p} (600 to 1100) MHz	 8.0 % + 100 µV	
Time Marker	1 ns to 10 ns 10 ns to 50 ms 50 ms to 5 s	0.018 % 0.009 % 0.12 %	

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Resistance – Generate, Fixed Points	1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	25 μΩ/MΩ 29 μΩ/MΩ 50 μΩ/MΩ 74 μΩ/MΩ 0.025 %	Fluke 5700A
Capacitance – Measure @ 1 kHz	(1 to 10) pF (10 to 100) pF (100 to 1000) pF (1 to 10) nF (10 to 100) nF (100 to 1000) nF	0.035 % 0.026 % 0.026 % 0.027 % 0.026 % 0.026 %	GenRad 1693
Capacitance – Generate @ 1 kHz	10 pF 100 pF 1000 pF 10 nF 100 nF	0.13 % 0.12 % 0.009 % 0.062 % 0.06 %	76-3A 1404A 1409L 1409T
Inductance – Measure @ 1 kHz @ 100 Hz	100 μH to 1 mH 1 mH to 1 H (1 to 5) H (5 to 10) H 1 mH 5 H	0.026 % 0.025% 0.026 % 0.026 % 0.029 % 0.028 %	Gen-Rad 1693
Inductance Generate – Fixed Points @ 1 kHz @ 100 Hz	1 mH 10 mH 100 mH 1 H 5 H 1 mH 5 H	0.12 % 0.12 % 0.16 % 0.12 % 0.16 % 0.13 % 0.18 %	Gen-Rad 1482-E Gen-Rad 1482-H Gen-Rad 1482-L Gen-Rad 1482-P Gen-Rad 1482-R Gen-Rad 1482-E Gen-Rad 1482-R

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Voltage – Generate			
(0.22 to 2.2) mV	(10 to 20) Hz	0.28 % + 5 µV	Fluke 5700A
	(20 to 40) Hz	0.17 % + 5 µV	
	40 Hz to 20 kHz	0.13 % + 5 µV	
	(20 to 50) kHz	0.22 % + 5 µV	
	(50 to 100) kHz	0.3 % + 8 µV	
	(100 to 300) kHz	0.5 % + 13 µV	
	(300 to 500) kHz	0.77 % + 35 µV	
	500 kHz to 1 MHz	0.96 % + 25 µV	
(2.2 to 22) mV	(10 to 20) Hz	0.051 % + 5 µV	
	(20 to 40) Hz	0.027 % + 5 µV	
	40 Hz to 20 kHz	0.023 % + 5 µV	
	(20 to 50) kHz	0.052 % + 5 µV	
	(50 to 100) kHz	0.1 % + 7 µV	
	(100 to 300) kHz	0.16 % + 12 µV	
	(300 to 500) kHz	0.23 % + 25 µV	
	500 kHz to 1 MHz	0.42 % + 25 µV	
(22 to 220) mV	(10 to 20) Hz	0.061 % + 13 µV	
	(20 to 40) Hz	0.024 % + 8 µV	
	40 Hz to 20 kHz	0.012 % + 5 µV	
	(20 to 50) kHz	0.034 % + 8 µV	
	(50 to 100) kHz	0.088 % + 25 µV	
	(100 to 300) kHz	0.12 % + 25 µV	
	(300 to 500) kHz	0.18 % + 35 µV	
	500 kHz to 1 MHz	0.36 % + 80 µV	
(0.22 to 2.2) V	(10 to 20) Hz	0.055 % + 80 µV	
	(20 to 40) Hz	0.018 % + 25 µV	
	40 Hz to 20 kHz	0.0083 % + 7 µV	
	(20 to 50) kHz	0.014 % + 16 µV	
	(50 to 100) kHz	0.027 % + 70 µV	
	(100 to 300) kHz	0.048 % + 130 µV	
	(300 to 500) kHz	0.11 % + 350 µV	
	500 kHz to 1 MHz	0.25 % + 800 µV	
(2.2 to 22) V	(10 to 20) Hz	0.055 % + 0.8 mV	
	(20 to 40) Hz	0.018 % + 0.25 mV	
	40 Hz to 20 kHz	0.0085 % + 0.062 mV	
	(20 to 50) kHz	0.014 % + 0.16 mV	
	(50 to 100) kHz	0.027 % + 0.35 mV	
	(100 to 300) kHz	0.056 % + 1.5 mV	
	(300 to 500) kHz	0.13 % + 4.3 mV	
	500 kHz to 1 MHz	0.31 % + 8.5 mV	

Parameter/Range	Frequency	CMC[2, 6, 8] (±)	Comments
AC Voltage – Generate (cont)			
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.055 % + 8 mV 0.019 % + 2.5 mV 0.0090 % + 1 mV 0.024 % + 3.5 mV 0.052 % + 9 mV 0.15 % + 90 mV 0.47 % + 90 mV 1.2 % + 190 mV	Fluke 5700A
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.04 % + 17 mV 0.0095 % + 4 mV	
AC Voltage – Measure			
(1 to 10) mV	(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	0.042 % + 3 µV 0.035 % + 1.1 µV 0.045 % + 1.1 µV 0.12 % + 1.1 µV 0.59 % + 1.1 µV 4.7 % + 2 µV	HP 3458A OPT-2
(10 to 100) mV	(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 (0.3 to 1) MHz (1 to 2) MHz	0.009 % + 4 µV 0.0099 % + 2 µV 0.018 % + 2 µV 0.036 % + 2 µV 0.10 % + 2 µV 0.36 % + 10 µV 1.2 % + 10 µV 1.8 % + 10 µV	
100 mV to 1 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 (0.3 to 1) MHz (1 to 2) MHz	0.01 % + 40 µV 0.01 % + 20 µV 0.02 % + 20 µV 0.04 % + 20 µV 0.10 % + 20 µV 0.36 % + 100 µV 1.2 % + 100 µV 1.8 % + 100 µV	

Parameter/Range	Frequency	CMC[2, 5, 6, 8] (±)	Comments
AC Voltage – Measure (cont)			
(1 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 (0.3 to 1) MHz (1 to 2) MHz	0.01 % + 0.4 mV 0.01 % + 0.2 mV 0.02 % + 0.2 mV 0.04 % + 0.2 mV 0.10 % + 0.2 mV 0.38 % + 1 mV 1.3 % + 1 mV 1.9 % + 1 mV	HP 3458A OPT-2
(10 to 100) 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 (0.3 to 1) MHz	0.027 % + 4 mV 0.025 % + 2 mV 0.027 % + 2 mV 0.043 % + 2 mV 0.15 % + 2 mV 0.5 % + 10 mV 1.8 % + 10 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.05 % + 20 mV 0.05 % + 20 mV 0.08 % + 20 mV 0.15 % + 20 mV 0.36 % + 20 mV	
AC Current[3] – Generate			
(30 to 220) µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	(45 to 1000) Hz	0.0096 % + 0.02 µA 0.013 % + 0.04 µA 0.014 % + 0.4 µA 0.015 % + 4 µA 0.055 % + 100 µA	Fluke 5700A
(2.2 to 11) A (11 to 20.5) A		0.048 % + 3 mA 0.07 % + 3 mA	Fluke 5520A/SC 1100 LCOMP off
AC Current[3] – Measure			
(5 to 100) µA (0.1 to 1) mA	(45 to 5000) Hz	0.079 % + 0.03 µA 0.039 % + 0.2 µA	HP 3458A OPT-2
(1 to 10) mA (10 to 100) mA (0.1 to 1) A (1 to 10) A		0.041 % + 2 µA 0.042 % + 20 µA 0.12 % + 0.2 mA 0.74 %+ 1.1 mA	HP 3458A Agilent 34330A

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Phase Angle[3] – Generate			
-90° to +90°	(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14° 0.34° 0.67° 3.4° 6.8° 14°	Fluke 5520A/SC1100
Measure 0° to 360° Voltage – Voltage	65 Hz to 10 kHz (10 to 100) kHz	1° 1.2°	Stanford Research SR830
Harmonic Distortion	(-99.9 to 0) dB: 20 Hz to 20 kHz (20 to 100) kHz	 1.2 dB 2.5 dB	HP8903B
AC/DC High Voltage – Measure			
DC High Voltage	(1 to 60) kV	0.15 %	VD60-6.2Y-A-LB-A w/ 289C
AC High Voltage	(1 to 60) kV, 50 Hz	0.49 %	VD60-6.2Y-A-LB-A w/ 289C

IV. Electrical – RF/Microwave

Parameter/Range[4]	Frequency	CMC[2, 8] (±)	Comments
Absolute RF Power[3] – Measure			
0 dBm	50 MHz	0.45 %	Precision measurements EL 1300 thermal converter
(+13 to -20) dBm	100 kHz to 2.6 GHz	0.11 dB	HP 8902A w/11722A power sensor

Parameter/Range[4]	Frequency	CMC[2, 8] (±)	Comments
Absolute RF Power[3] – Measure (cont)			
(+13 to -30) dBm	(100 to 300) kHz 300 kHz to 1 MHz 1 MHz to 2 GHz (2 to 4.2) GHz	1.9 % 1.9 % 1.9 % 1.9 %	HP 438A w/HP8482A
	(4.2 to 10) GHz (10 to 18) GHz (18 to 26) GHz (26 to 40) GHz (40 to 50) GHz	2.7 % 2.8 % 3.1 % 3.3 % 4.5 %	HP438A w/HP 8487A
(-70 to -20) dBm	50 MHz to 1 GHz (1 to 12) GHz (12 to 26) GHz (26 to 40) GHz (40 to 50) GHz	1.8 % 1.9 % 1.9 % 3.5 % 4.3 %	HP 438A w/HP 8487A HP 438A w/HP 8487D HP 438A w/HP 8487A
Tuned RF Power[3], Relative – Measure			
0 dB, Reference (-0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (-80 to -90) dB (-90 to -100) dB (-100 to -110) dB (-110 to -120) dB	2.5 MHz to 1.3 GHz	0 dB 0.23 dB 0.25 dB 0.27 dB 0.30 dB 0.31 dB 0.38 dB 0.43 dB 0.47 dB 0.52 dB 0.57 dB 0.62 dB 0.67 dB	HP 8902A, HP 11722A
0 dB, Reference (-0 to -10) dB (-10 to -20) dB (-20 to -30) dB (-30 to -40) dB (-40 to -50) dB (-50 to -60) dB (-60 to -70) dB (-70 to -80) dB (-80 to -90) dB (-90 to -100) dB (-100 to -110) dB	(1.3 to 26.5) GHz	0 dB 0.33 dB 0.39 dB 0.47 dB 0.55 dB 0.63 dB 0.72 dB 0.80 dB 0.89 dB 0.99 dB 1.1 dB 1.2 dB	HP 8902A, HP 11792A, HP11793A

Parameter/Range[4]	Frequency	CMC[2, 8] (±)	Comments
Amplitude Modulation[3] – Measure			
Rate 50 Hz to 10 kHz Depths: 5 % to 99 %	(0.15 to 10) MHz	2.7 % + 1 digit	HP 8902A w/ 11722A sensor
Rate 20 Hz to 10 kHz Depths: 0 % to 99 %		3.7 % + 1 digit	
Rate 20 Hz to 100 kHz Depths: 0 % to 99 %	(10 to 1300) MHz	3.8 % + 1 digit	
Rate 50 Hz to 50 kHz Depths: 5 % to 99 %		1.8 % + 1 digit	
Rate 50 Hz to 50 kHz Depths: 5 % to 99 %	(1.3 to 26.5) GHz	4.2 % + 1 digit	HP 8902A w/ 11793A
Rate 20 Hz to 100 kHz Depths: 0 % to 99 %		5.2 % + 1 digit	
Frequency Modulation[3] – Measure			
Rate 20 Hz to 10 kHz Dev.:≤ 40 kHz Peak	(0.25 to 10) MHz	2.3 % + 1 digit	HP 8902A w/ 11722A and 11792A sensors
Rate 50 Hz to 100 kHz Dev.:≤ 400 kHz Peak	(10 to 1300) MHz	1.2 % + 1 digit	
Rate 20 Hz to 200 kHz Dev.:≤ 400 kHz Peak		5.8 % + 1 digit	
Rate 50 Hz to 100 kHz Dev.:≤ 400 kHz Peak	10 MHz to 26.5 GHz	1.2 % + 1 digit	HP 8902A w/ 11793A
Rate 20 Hz to 200 kHz Dev.:≤ 400 kHz Peak		5.8 % + 1 digit	

V. Mechanical

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Scales & Balances[3] – Fixed Points	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 300 g 500 g 1000 g	0.12 mg + 0.6*R* 0.14 mg + 0.6*R* 0.17 mg + 0.6*R* 0.23 mg + 0.6*R* 0.29 mg + 0.6*R* 0.35 mg + 0.6*R* 0.58 mg + 0.6*R* 3.5 mg + 0.6*R* 5.2 mg + 0.6*R* 8.7 mg + 0.6*R* 17 mg + 0.6*R*	OIML Class F1 and Class F2 weights; *R* = Resolution Using substitution method to 16 kg, CMC is increased by a multiple for each substitution. All measurement uncertainties will also include resolution of the unit under test
	2 kg 5 kg 10 kg 20 kg 25 kg	0.14 g + 0.6*R* 0.31 g + 0.6*R* 0.61 g + 0.6*R* 1.2 g + 0.6*R* 1.5 g + 0.6*R*	OIML Class M1 weights using substitution method to 348 kg, CMC is increased by a multiple for each substitution. All measurement uncertainties will also include resolution of the unit under test
	20 kg 100 kg 200 kg 300 kg 400 kg 500 kg 600 kg	0.12 g + 0.6*R* 0.59 g + 0.6*R* 1.2 g + 0.6*R* 1.8 g + 0.6*R* 2.4 g + 0.6*R* 3.0 g + 0.6*R* 3.6 g + 0.6*R*	OIML Class F1 weights using substitution method to 2400 kg, CMC is increased by a multiple for each substitution. All measurement uncertainties will also include resolution of the unit under test
Pneumatic Gage Pressure – Measuring Equipment	(0 to 300) psig	0.18 psi + 0.6*R*	Druck DPI 605 *R* = Resolution
Torque Wrenches	(2.5 to 25) lbf·in (25 to 250) lbf·in (10 to 100) lbf·ft (75 to 750) lbf·ft	0.90 % 0.59 % 0.58 % 0.64 %	Torque display w/ transducers: AWS AWS-4050 ITI-25, ITI-250, ITF-100, ITF-750
Mass[3]	20 kg	0.18 g	Class F1 20kg mass
Force – Tension and Compression[3] – Measuring Equipment	Up to 85 kgf	0.2 %	Class F1 mass pieces

VI. Optical Quantities

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Fiber Optic Wavelength – Measuring Equipment	(1510 to 1530) nm (1530 to 1560) nm (1560 to 1595) nm (1595 to 1630) nm	0.75 pm 0.69 pm 2.0 pm 2.0 pm	Preselected wavelengths w/ NIST SRM 2517a NIST SRM 2519a NIST SRM 2514 NIST SRM 2515
Fiber Optic Wavelength – Measure	(700 to 1650) nm	0.006 nm	Agilent 86120B
Fiber Optic Power – Measuring Equipment 1310 nm (1450 to 1590) nm 1550 nm	 (-40 to -1) dBm (-40 to +7) dBm (-40 to -1) dBm	 3.0 % 3.0 % 3.0 %	 Laser power sources monitored by Agilent 8163A, 81533A, 81521B
Fiber Optic Power – Measure 1310 nm 1550 nm (1000 to 1630) nm	 (-40 to +10) dBm (-40 to +10) dBm (-40 to +10) dBm	 2.9 % 2.9 % 2.9 %	 Agilent 8163A, 81533A and 81521B

VII. Thermodynamics

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Temperature – Measure	(-200 to 380) ˚C	0.16 °C + 2 m°C/°C	34970A/34901A w/ PT100 RTD probe
(Oven, Chamber, Furnace, Bath)	(400 to 1000) ˚C	0.75 % + 1.0 °C	Fluke 741B w/thermocouple probe
Temperature – Measuring Equipment	0 ˚C (35 to 380) ˚C (400 to 650) ˚C	0.18 °C 0.21 °C 0.75 % + 1.1 °C	34970A/34901A w/ PT100 RTD probe, bath Fluke 741B w/Type K thermocouple probe, bath

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Humidity – Measuring Equipment	(11 to 75) % RH	1.3 % RH	ROTRONIC HC2-S, salt solutions

VIII. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7, 10] (±)	Comments
Frequency – Measuring Equipment	(5, 10) MHz 100 µHz to 10 MHz 10 MHz to 50 GHz	0.04 µHz/Hz 0.06 µHz/Hz 0.06 µHz/Hz	Fluke 910 GPS Agilent 33120A, HP 83650B
Frequency – Measure	0.1 Hz to 26.5 GHz	13 nHz/Hz	Fluke 910 GPS, Agilent 53151A
Time Interval – Measure	25 ps to 1 s	1.2 %	Agilent 86100A w/ 86105A

[1] This laboratory offers commercial calibration service and field calibration service.

[2] 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.

[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] Where ranges are not specified, the CMC stated is for the cardinal points only.

[5] Based on using the standard at the temperature the Fluke 5520A with SC1100 was calibrated (tcal ± 5 ºC) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 ºC. For resistance, a zero calibration is performed at least every 12 hours within ± 1 ºC of use. In the statement of CMC, the value is defined as the percentage of reading.

[6] Based on using the standard at the temperature the HP 3458A was calibrated (tcal ± 5 ºC) and an auto-calibration (ACAL) was performed within the previous 24 hours (± 1 ºC of ambient temperature). In the statement of Calibration and Measurement Capability (CMC), the value is defined as the percentage of reading.

[7] In the statement of CMC, *L* is the numerical value of the nominal length of the device measured in inches; *R* is the numerical value of the resolution of the device, and percentages are to be read as percent of reading, unless noted otherwise.

[8] 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.

[9] This scope meets A2LA's *P112 Flexible Scope Policy*.

[10] 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

SIMCO SCIENTIFIC INSTRUMENT REPAIR AND CALIBRATION SERVICES CO., LTD.

Guangzhou, People's Republic of China

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/NCSL 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 24th day of January 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1395.18
Valid to September 30, 2021

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