



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017,
ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

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CALIBRATION

Valid To: June 30, 2024

Certificate Number: 2357.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 7}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 5} (\pm)	Comments
Micrometers ³ –	Up to 4 in (4 to 12) in (12 to 48) in	(9.4 + 1.7L) μ in (16 + 4.4L) μ in (51 + 3.3L) μ in	Gage blocks
Flatness	Up to 1 in	5.1 μ in	Optical flat
Calipers ³	Up to 4 in (4 to 12) in (12 to 48) in	(58 + 0.51L) μ in (58 + 1.4L) μ in (35 + 3.2L) μ in	Gage blocks
Height Gages ³	Up to 4 in (4 to 12) in (12 to 48) in	(58 + 0.51L) μ in (58 + 1.4L) μ in (35 + 3.2L) μ in	Gage blocks
Indicators ³	Up to 4 in	(14 + 0.76L) μ in	Gage blocks, UMM

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Depth Gages ³	Up to 4 in (4 to 12) in (12 to 48) in	(58 + 0.51L) μin (53 + 1.8L) μin (35 + 3.2L) μin	Gage blocks
Pins & Plugs ³	Up to 2 in	38 μin	P&W Supermicrometer™, Gage blocks
Feeler Gages	(0.001 to 0.100) in	29 μin	P&W Supermicrometer™, Gage blocks

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate ³	(0 to 219.999 99) mV (0.22 to 2.1999 999) V (2.2 to 10.999 999) V (11 to 21.999 999) V (22 to 219.999 99) V (220 to 1100) V	9.0 μV/V + 0.62 μV 7.2 μV/V + 0.93 μV 7.2 μV/V + 3.1 μV 7.2 μV/V + 6.2 μV 7.9 μV/V + 78 μV 9.3 μV/V + 0.47 mV	Fluke 5700A
DC Voltage – Measure ³	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1050) V (0 to 10 000) V (10 000 to 60 000) V	6.0 μV/V + 0.93 μV 3.6 μV/V + 0.39 μV 3.6 μV/V + 3.9 μV 5.5 μV/V + 39 μV 5.5 μV/V + 0.49 mV 0.35 mV/V + 35 mV 0.74 mV/V + 0.23 V	Fluke 8508A Vitretek 4700

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Current – Generate ³	(0 to 219.9999) µA (0.22 to 2.199 999) mA (2.2 to 21.999 99) mA (22 to 219.9999) mA (0.22 to 2.199 999) A (2.2 to 11) A	47 µA/A + 8.0 µA 47 µA/A + 8.0 µA 47 µA/A + 80 µA 55 µA/A + 0.80 µA 75 µA/A + 25 µA 0.31 mA/A + 0.48 mA	Fluke 5700A Fluke 5700A w/ 5725A
	(11 to 20.5) A	0.78 mA/A + 0.58 mA	Fluke 5520A
Clamp-On Only ³	(16.5 to 149.999) A (150 to 1025) A	3.9 mA/A + 0.11 mA 4.0 mA/A + 0.39 mA	Fluke 5520A Fluke 50 turn coil
DC Current – Measure ³	(0 to 200) µA (0.2 to 2) mA (2 to 20) mA (20 to 200) mA (0.2 to 2) A (2 to 20) A	13 µA/A + 0.31 nA 13 µA/A + 3.1 nA 14 µA/A + 31 nA 48 µA/A + 0.62 µA 0.18 mA/A + 12 µA 0.41 mA/A + 0.31 mA	Fluke 8508A
	(20 to 300) A	1.6 mA/A	Honeywell 1168

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³			
Up to 2.2 mV	(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 (0.5 to 1) MHz	1.5 mV/V + 3.9 µV 1.1 mV/V + 3.9 µV 1.1 mV/V + 3.9 µV 1.8 mV/V + 3.9 µV 2.4 mV/V + 6.2 µV 4.2 mV/V + 12 µV 6.2 mV/V + 23 µV 7.9 mV/V + 31 µV	Fluke 5700A

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(2.2 to 22) mV	(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 (0.5 to 1) MHz	0.53 mV/V + 4.7 μV 0.26 mV/V + 4.7 μV 0.21 mV/V + 4.7 μV 0.44 mV/V + 4.7 μV 0.85 mV/V + 6.2 μV 1.4 mV/V + 12 μV 1.8 mV/V + 23 μV 4.3 mV/V + 31 μV	Fluke 5700A
(22 to 220) mV	(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 (0.5 to 1) MHz	0.55 mV/V + 12 μV 0.19 mV/V + 7.8 μV 96 μV/V + 7.8 μV 0.29 mV/V + 7.8 μV 0.72 mV/V + 23 μV 0.89 mV/V + 23 μV 1.5 mV/V + 31 μV 3.0 mV/V + 78 μV	
2.2 mV to 2.2 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 (0.5 to 1) MHz	0.63 mV/V + 78 μV 0.14 mV/V + 23 μV 70 μV/V + 5.4 μV 0.12 mV/V + 16 μV 0.24 mV/V + 62 μV 0.41 mV/V + 0.12 mV 0.97 mV/V + 0.31 V 2.0 mV/V + 0.78 mV	
(2.2 to 22) 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 (0.5 to 1) MHz	0.55 mV/V + 0.78 mV 0.15 mV/V + 0.23 mV 71 μV/V + 54 μV 0.12 mV/V + 0.16 mV 0.23 mV/V + 0.31 mV 0.5 mV/V + 1.3 mV 1.2 mV/V + 3.9 mV 2.6 mV/V + 7.0 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (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 (0.5 to 1) MHz	0.59 mV/V + 7.8 mV 0.15 mV/V + 2.3 mV 89 μV/V + 0.78 mV 0.21 mV/V + 3.1 mV 0.48 mV/V + 7.8 mV 1.3 mV/V + 85 mV 4.5 mV/V + 85 mV 11 mV/V + 0.17 V	Fluke 5700A
(220 to 1000) V	(15 to 50) Hz 50 Hz to 1 kHz	0.36 mV/V + 16 mV 83 μV/V + 3.1 mV	
(220 to 750) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz (30 to 50) kHz (50 to 100) kHz	83 μV/V + 3.1 mV 0.14 mV/V + 4.7 mV 0.49 mV/V + 8.5 mV 0.48 mV/V + 8.5 mV 1.8 mV/V + 35 mV	Fluke 5700A w/ Fluke 5725A
AC Voltage – Measure ³			
Up to 199.99 mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.62 mV/V + 16 μV 0.15 mV/V + 5.0 μV 0.11 mV/V + 5.0 μV 0.11 mV/V + 2.0 μV 0.13 mV/V + 5.0 μV 0.31 mV/V + 10 μV 0.68 mV/V + 24 μV	Fluke 8508A
(0.2 to 1.9999) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.93 mV/V + 0.14 mV 0.11 mV/V + 24 μV 0.14 mV/V + 24 μV 74 μV/V + 24 μV 0.11 mV/V + 24 μV 0.21 mV/V + 50 μV 0.54 mV/V + 0.24 mV 2.4 mV/V + 2.4 mV 8.1 mV/V + 24 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Measure ³ (cont)			
(2 to 19.999) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.65 mV/V + 1.4 mV 0.13 mV/V + 0.20 mV 90 μV/V + 0.20 mV 75 μV/V + 0.20 mV 0.11 mV/V + 0.20 mV 0.2 mV/V + 0.50 mV 0.51 mV/V + 2.4 mV 2.3 mV/V + 24 mV 8.1 mV/V + 0.24 V	Fluke 8508A
(20 to 199.9) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz (0.3 to 1) MHz	0.8 mV/V + 14 mV 0.12 mV/V + 2.4 mV 0.1 mV/V + 2.4 mV 78 μV/V + 2.4 mV 0.11 mV/V + 2.4 mV 0.2 mV/V + 5.0 mV 0.52 mV/V + 24 mV 2.3 mV/V + 0.24 V 8.1 mV/V + 2.4 mV	
(100 to 1050) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.16 mV/V + 80 mV 0.12 mV/V + 25 mV 0.15 mV/V + 25 mV 0.37 mV/V + 50 mV 0.62 mV/V + 0.25 V	
(100 to 1000) V (1000 to 9000) V (9000 to 50 000) V	(50/60) Hz (50/60) Hz (50/60) Hz	1.4 mV/V + 0.12 V 1.5 mV/V + 0.12 V 1.6 mV/V + 0.46 V	Vitrek 4700
AC Level Flatness ³			
(0.5, 1, 3) V	Up to 10 kHz (> 10 to 30) kHz (> 30 to 300) kHz (> 0.3 to 1) MHz (> 1 to 10) MHz (> 10 to 20) MHz (> 20 to 30) MHz	0.12 % 0.23 % 0.29 % 0.58 % 0.70 % 0.72 % 1.7 %	0.5 V – 50 Ω thermal converters w/ HP 3458A & Fluke 5700A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Level Flatness ³ (cont) (0.5, 1, 3) V	 (> 30 to 50) MHz (> 50 to 70) MHz (> 70 to 80) MHz (> 80 to 100) MHz	 2.6 % 3.5 % 3.9 % 4.7 %	 0.5 V – 50 Ω thermal converters w/ HP 3458A & Fluke 5700A
AC Current – Generate ³ Up to 220 µA	 (10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	 0.70 mA/A + 25 nA 0.33 mA/A + 20 nA 0.14 mA/A + 16 nA 0.52 mA/A + 40 nA 1.3 mA/A + 80 nA	 Fluke 5700A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.68 mA/A + 40 nA 0.34 mA/A + 35 nA 0.17 mA/A + 35 nA 0.53 mA/A + 0.40 µA 1.3 mA/A + 0.80 µA	
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.68 mA/A + 0.40 µA 0.33 mA/A + 0.35 µA 0.14 mA/A + 0.35 µA 0.52 mA/A + 4.0 µA 1.3 mA/A + 8.0 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.68 mA/A + 4.0 µA 0.33 mA/A + 3.5 µA 0.15 mA/A + 3.5 µA 0.52 mA/A + 40 µA 1.3 mA/A + 80 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.56 mA/A + 35 µA 0.68 mA/A + 80 µA 7.4 mA/A + 0.16 mA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.38 mA/A + 0.17 mA 0.76 mA/A + 0.38 mA 2.8 mA/A + 0.75 mA	Fluke 5700A w/ 5725A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Current – Generate ³ (cont)			
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.96 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA	Fluke 5520A
Clamp-On Only ³ Toroidal Type Clamps			
(16.5 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.39 % 0.84 %	Fluke 5520A SC 1100 & Fluke 50-turn coil
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.38 % 0.84 %	
Non-Toroidal Type Clamps			
(16.5 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.77 % 1.2 %	
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	1.2 % 1.6 %	
AC Current – Measure ³			
Up to 199.99 µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.8 mA/A + 20 nA 1.9 mA/A + 20 nA 1.9 mA/A + 20 nA 3.6 mA/A + 20 nA	Fluke 8508A
(0.2 to 1.9999) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.62 mA/A + 0.20 µA 1.7 mA/A + 0.20 µA 1.8 mA/A + 0.20 µA 3.6 mA/A + 0.20 µA	
(2 to 19.999) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.6 mA/A + 2.0 µA 1.5 mA/A + 2.0 µA 1.6 mA/A + 2.0 µA 5.2 mA/A + 2.0 µA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Measure ³ (cont)			
(20 to 199.99) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.62 mA/A + 20 µA 1.1 mA/A + 20 µA 1.4 mA/A + 20 µA	Fluke 8508A
(0.2 to 1.9999) A	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.65 mA/A + 0.20 mA 6.1 mA/A + 0.20 mA 6.5 mA/A + 0.20 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.89 mA/A + 0.20 mA 4.2 mA/A + 0.20 mA	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Resistance – Generate ³	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (0.33 to 1.099 999) kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ (0.33 to 1.099 999) MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	40 µΩ/Ω + 0.78 mΩ 30 µΩ/Ω + 1.2 mΩ 25 µΩ/Ω + 1.1 mΩ 28 µΩ/Ω + 1.6 mΩ 27 µΩ/Ω + 1.6 mΩ 25 µΩ/Ω + 16 mΩ 25 µΩ/Ω + 16 mΩ 29 µΩ/Ω + 0.16 Ω 26 µΩ/Ω + 0.16 Ω 31 µΩ/Ω + 1.6 Ω 32 µΩ/Ω + 1.6 Ω 47 µΩ/Ω + 23 Ω 0.13 mΩ/Ω + 39 Ω 0.21 mΩ/Ω + 1.9 kΩ 0.42 mΩ/Ω + 2.3 kΩ 2.3 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 0.39 MΩ	Fluke 5520A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Resistance – Generate ³ (cont)			
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	0.13 mΩ 0.18 mΩ 0.26 mΩ 0.48 mΩ 1.6 mΩ 3.0 mΩ 12 mΩ 23 mΩ 0.11 Ω 0.21 Ω 1.2 Ω 3.0 Ω 50 Ω 60 Ω 0.36 kΩ 0.82 kΩ 10 kΩ	Fluke 5700
DC Resistance – Measure ³	(0 to 2) Ω (2 to 20) Ω (0 to 200) Ω (0.2 to 2) kΩ (2 to 20) kΩ (2 to 200) kΩ (0.2 to 2) MΩ (2 to 20) MΩ (20 to 200) MΩ (0.2 to 2) GΩ (2 to 20) GΩ	19 μΩ/Ω + 4.0 μΩ 10 μΩ/Ω + 14 μΩ 8.8 μΩ/Ω + 50 μΩ 8.7 μΩ/Ω + 0.50 MΩ 8.7 μΩ/Ω + 5.0 MΩ 8.9 μΩ/Ω + 50 MΩ 11 μΩ/Ω + 1.0 Ω 21 μΩ/Ω + 10 Ω 68 μΩ/Ω + 1.0 kΩ 0.19 MΩ/GΩ + 0.10 MΩ 1.5 MΩ/GΩ + 10 MΩ	Fluke 8508A true ohms mode Normal mode High voltage mode
Ohms Law Method	Up to 1 mΩ 1 mΩ to 1 Ω (1 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ 100 kΩ to 1 MΩ 1 MΩ to 1 GΩ (1 to 10) GΩ (10 to 100) GΩ	7.0 μΩ/Ω 51 μΩ/Ω 12 μΩ/Ω 7.0 μΩ/Ω 11 μΩ/Ω 0.13 mΩ/Ω 4.9 mΩ/Ω 2.3 mΩ/Ω 1.7 mΩ/Ω	Fluke 8508A w/ standard resistors

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple Indicators ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.33 °C 0.27 °C 0.24 °C 0.21 °C	Fluke 5520A, SC1100
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.19 °C 0.15 °C 0.19 °C 0.30 °C 0.49 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.30 °C 0.099 °C 0.085 °C 0.099 °C 0.13 °C	
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 0.11 °C 0.091 °C 0.11 °C 0.15 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.20 °C 0.12 °C 0.10 °C 0.15 °C 0.24 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.29 °C 0.20 °C 0.14 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.24 °C 0.14 °C 0.12 °C 0.11 °C 0.17 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments	
Electrical Simulation of Thermocouple Indicators ³ – (cont)				
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.38 °C 0.22 °C 0.21 °C 0.24 °C	Fluke 5520A, SC1100	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.24 °C 0.22 °C 0.27 °C		
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.38 °C 0.14 °C 0.099 °C 0.085 °C		
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.21 °C		
Electrical Simulation of RTDs 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	0.082 °C 0.12 °C 0.12 °C 0.10 °C 0.091 °C 0.10 °C 0.18 °C		Fluke 5520A, SC1100
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	0.060 °C 0.076 °C 0.075 °C 0.083 °C 0.089 °C 0.16 °C		

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTDs ³ – (cont)			
Pt 3916, 100 Ω	(-200 to -190) °C	0.21 °C	Fluke 5520A, SC1100
	(-190 to -80) °C	0.060 °C	
	(-80 to 0) °C	0.068 °C	
	(0 to 100) °C	0.070 °C	
	(100 to 260) °C	0.072 °C	
	(260 to 300) °C	0.078 °C	
	(300 to 400) °C	0.085 °C	
	(400 to 600) °C	0.13 °C	
Pt 385, 200 Ω	(600 to 630) °C	0.17 °C	
	(-200 to -80) °C	0.035 °C	
	(-80 to 0) °C	0.038 °C	
	(0 to 100) °C	0.044 °C	
	(100 to 260) °C	0.045 °C	
	(260 to 300) °C	0.090 °C	
	(300 to 400) °C	0.098 °C	
	(400 to 600) °C	0.10 °C	
Pt 385, 500 Ω	(600 to 630) °C	0.11 °C	
	(-200 to -80) °C	0.030 °C	
	(-80 to 0) °C	0.037 °C	
	(0 to 100) °C	0.044 °C	
	(100 to 260) °C	0.051 °C	
	(260 to 300) °C	0.058 °C	
	(300 to 400) °C	0.058 °C	
	(400 to 600) °C	0.066 °C	
Pt 385, 1000 Ω	(600 to 630) °C	0.073 °C	
	(-200 to -80) °C	0.029 °C	
	(-80 to 0) °C	0.029 °C	
	(0 to 100) °C	0.029 °C	
	(100 to 260) °C	0.035 °C	
	(260 to 300) °C	0.042 °C	
	(300 to 400) °C	0.18 °C	
	(400 to 600) °C	0.050 °C	
(600 to 630) °C	0.17 °C		

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Simulation of RTDs ³ – (cont)			
PtNi 385, 120 Ω (Ni120)	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.070 °C 0.10 °C 0.10 °C	Fluke 5520A, SC1100
Cu 427, 10 Ω	(-100 to 260) °C	0.69 °C	
Oscilloscopes ³ –			
Amplitude DC: 50 Ω Load 1 MΩ Load	(0 to ± 6.6) V (0 to ± 130) V	1.9 mV/V + 24 μV 0.37 mV/V + 24 μV	Fluke 5520A, SC1100
Amplitude Square Wave: 50 Ω Load 1 MΩ Load	1 mV to 6.6 V 1 mV to 130 V	1.9 mV/V + 24 μV 0.78 mV/V + 24 μV	
Leveled Sine Wave – Flatness Relative to 50 kHz	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	3.0 % + 78 μV 3.1 % + 78 μV 4.1 % + 78 μV 4.2 % + 78 μV	
Time Marker – Into 50 Ω Load	50 ms to 5 s 1 ns to 20 ms Non-Cardinal Points 20 ms or less	7.8 ms/s + 0.0019 % 2.5 μs/s 39 μs/s	
Edge Specs into 50 Ω Load – Rise Time	1 kHz to 2 MHz (200 to 300) ps	20 ps	
	(2 to 10) MHz (200 to 350) ps	20 ps	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
Capacitance – Generate ³ (220 to 399.9) pF (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 (0.33 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 (0.33 to 1.09999) mF (1.1 to 3.29999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz (0.01 to 1) kHz (0.01 to 1) kHz (0.01 to 1) kHz (0.01 to 1) kHz (0.01 to 1) kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	5.8 mF/F + 7.8 pF 4.0 mF/F + 7.8 pF 3.9 mF/F + 7.8 pF 2.1 mF/F + 7.8 pF 2.0 mF/F + 78 pF 2.1 mF/F + 78 pF 2.0 mF/F + 0.23 nF 2.1 mF/F + 0.78 nF 2.0 mF/F + 2.3 nF 2.1 mF/F + 7.8 nF 3.2 mF/F + 23 nF 3.6 mF/F + 78 nF 3.5 mF/F + 0.23 μF 3.5 mF/F + 0.78 μF 3.5 mF/F + 2.3 μF 3.5 mF/F + 7.8 μF 5.8 mF/F + 23 μF 8.6 mF/F + 78 μF	Fluke 5520A
Distortion – Measure ³ (-99 to 0) dB	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.4 dB	HP 8903B

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
RF Power – Generate ³ (16 to 24) dBm (3 to 16) dBm	(0.2 to 100) kHz (0.1 to 125) MHz (0.2 to 100) kHz (0.1 to 150) MHz (0.25 to 1.4) GHz	0.023 dB 0.045 dB 0.023 dB 0.043 dB 0.16 dB	Fluke 96270A/LL/FF w/ leveling head

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
RF Power – Generate ³ (cont)			
(-7 to 3) dBm	(0.2 to 100) kHz (0.1 to 300) MHz (0.3 to 1.4) GHz (1.4 to 4.0) GHz	0.024 dB 0.047 dB 0.16 dB 0.26 dB	Fluke 96270A/LL/FF w/ leveling head
(-47 to -17) dBm	(0.2 to 100) kHz (0.1 to 300) MHz (0.3 to 1.4) GHz (1.4 to 3.5) GHz (3.5 to 4.0) GHz	0.024 dB 0.047 dB 0.16 dB 0.24 dB 0.40 dB	
(-66 to -47) dBm	(0.1 to 10) MHz (10 to 300) MHz (0.3 to 1.4) GHz (1.4 to 4) GHz	0.16 dB 0.083 dB 0.31 dB 0.41 dB	
(-85 to -66) dBm	(0.1 to 10) MHz (10 to 150) MHz (0.15 to 1.5) GHz (1.5 to 4) GHz	0.56 dB 0.41 dB 0.82 dB 0.80 dB	
(-124 to -84) dBm	(10 to 100) MHz (0.1 to 1.4) GHz	0.60 dB 1.4 dB	Fluke 96270A/LL/FF w/ leveling head
(-4 to +24) dBm	(Microwave Output) Up to 100 MHz (0.1 to 1.4) GHz	0.43 % 0.57 %	
(-4 to +20) dBm	(1.4 to 2.4) GHz (2.4 to 8) GHz (8 to 12) GHz (12 to 18) GHz (18 to 22) GHz (22 to 26.5) GHz	0.70 % 0.88 % 1.0 % 1.2 % 1.6 % 2.5 %	
(-60 to +13) dBm (-90 to -60) dBm	(0.1 to 26.5) GHz	1.8 dBm 2.3 dBm	Agilent/HP 83630B
Sine Output Level Accuracy – 50 Ω (Microwave Output)			
(-35 to +18) dB	1 kHz to 100 MHz > 100 MHz to 1.4 GHz	0.11 dBm 0.12 dBm	Fluke 96270A w/ Rohde & Schwarz NRP-Z55
(-35 to +14) dB	(1.4 to 2.4) GHz (> 2.4 to 8) GHz (> 8 to 12.4) GHz (> 12.4 to 18) GHz (> 18 to 20) GHz	0.14 dBm 0.17 dBm 0.17 dBm 0.23 dBm 0.26 dBm	
(-35 to +12) dB	(>20 to 26.5) GHz	0.34 dBm	

Parameter/Range	Frequency	CMC ^{2,4,6} (±)	Comments
RF Power – Measure ³			
(-30 to + 20) dBm	100 kHz to 1 MHz	1.6 %	HP E4419B w/ HP 8482A
	(1 to 50) MHz	1.4 %	
	(0.05 to 2) GHz	1.3 %	
	(2 to 4.2) GHz	1.8 %	
(-30 to + 20) dBm	50 MHz to 12 GHz	1.7 %	HP 8485A-H84
	(12 to 18) GHz	2.2 %	
	(18 to 26.5) GHz	3.9 %	
(-70 to -20) dBm	(10 to 30) MHz	2.1 %	HP 8484A
	30 MHz to 4 GHz	1.5 %	
	(4 to 6) GHz	1.6 %	
	(6 to 10) GHz	1.7 %	
	(10 to 14) GHz	2.0 %	
	(14 to 15) GHz	2.1 %	
	(15 to 18) GHz	2.5 %	
(-140 to -60) dBm	9 kHz to 2.9 GHz	3.0 dB	HP 8563E
	(2.9 to 6.46) GHz	3.5 dB	
	(6.46 to 13.2) GHz	4.0 dB	
	(13.2 to 26.5) GHz	5.1 dB	
(-30 to +20) dBm	DC to 100 MHz	0.035 dBm	Fluke 96270A w/ Rohde & Schwarz NRP-Z55
	> 100 MHz to 2.4 GHz	0.042 dBm	
	(> 2.4 to 8) GHz	0.064 dBm	
	(> 8 to 12.4) GHz	0.080 dBm	
	(> 12.4 to 18) GHz	0.11 dBm	
	(> 18 to 26.5) GHz	0.098 dBm	

Parameter/Range	Frequency	CMC ^{2, 4, 6} (±)	Comments
Power Reference – Measure ³	1 mW @ 50 MHz	2.9 %	Agilent 478-H76, HP 432, 3458A
RF Attenuation ³ – Measure & Generate			
(0 to -10) dB	(2.5 to 1300) MHz	0.064 dB	HP 8902A-050, w/ HP 8494B & HP 8496B
(-10 to -20) dB	(2.5 to 1300) MHz	0.067 dB	
(-20 to -30) dB	(2.5 to 1300) MHz	0.069 dB	
(-30 to -40) dB	(2.5 to 1300) MHz	0.082 dB	
(-40 to -50) dB	(2.5 to 1300) MHz	0.10 dB	
(-50 to -60) dB	(2.5 to 1300) MHz	0.10 dB	
(-60 to -70) dB	(2.5 to 1300) MHz	0.11 dB	
(-70 to -80) dB	(2.5 to 1300) MHz	0.11 dB	
(-80 to -90) dB	(2.5 to 1300) MHz	0.14 dB	
(-90 to -100) dB	(2.5 to 1300) MHz	0.14 dB	
(-100 to -110) dB	(2.5 to 1300) MHz	0.15 dB	
(-110 to -120) dB	(2.5 to 1300) MHz	0.18 dB	
(-120 to -127) dB	(2.5 to 1300) MHz	0.20 dB	
(0 to -10) dB	(1.3 to 26.5) GHz	0.064 dB	HP 8902A-050, w/ HP 8494B & HP 8496B & HP 11793A
(-10 to -20) dB	(1.3 to 26.5) GHz	0.067 dB	
(-20 to -30) dB	(1.3 to 26.5) GHz	0.080 dB	
(-30 to -40) dB	(1.3 to 26.5) GHz	0.082 dB	
(-40 to -50) dB	(1.3 to 26.5) GHz	0.10 dB	
(-50 to -60) dB	(1.3 to 26.5) GHz	0.10 dB	
(-60 to -70) dB	(1.3 to 26.5) GHz	0.11 dB	
(-70 to -80) dB	(1.3 to 26.5) GHz	0.11 dB	
(-80 to -85) dB	(1.3 to 26.5) GHz	0.14 dB	
Amplitude Modulation – Generate ³			
Rate: 50 Hz to 50 kHz Depths: (0 to 99) %	(11 to 13.5) MHz	0.22 %	HP 11715A w/ 33250A
Rate: 20 Hz to 100 kHz Depths: (0 to 99) %	(11 to 13.5) MHz	0.34 %	

Parameter/Range	Frequency	CMC ^{2,4,6} (±)	Comments
Amplitude Modulation – Generate & Measure³			
Rate: 50 Hz to 10 kHz Depths: (5 to 95) %	150 kHz to 10 MHz	2.4 % + 1 digit	HP 8902A, HP 8663A
Rate: 20 Hz to 10 kHz Depths: (0 to 99) %	150 kHz to 10 MHz	3.5 % + 1 digit	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(10 to 1300) MHz	1.3 % + 1 digit	
Rate: 20 Hz to 100 kHz Depths: (0 to 99) %	(10 to 1300) MHz	3.5 % + 1 digit	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(1.3 to 26.5) GHz	1.8 % + 1 digit	HP 8902A, HP 11793A & HP 83630B
Rate: 20 Hz to 100 kHz Depths: (0 to 99) %	(1.3 to 26.5) GHz	3.5 % + 1 digit	
Frequency Modulation – Generate and Measure³			
Rate: ≤ 100 kHz Dev.: ≤ 12.5 kHz peak	(11 to 13.5) MHz	0.44 %	HP 11715A, HP 33250A
Rate: (100 to 200) kHz Dev.: ≤ 12.5 kHz peak	(11 to 13.5) MHz	0.43 %	
Rate: ≤ 100 kHz Dev.: ≤ 100 kHz peak	(88 to 108) MHz	0.43 %	
Rate: (100 to 200) kHz Dev.: ≤ 100 kHz peak	(88 to 108) MHz	0.43 %	
Rate: ≤ 100 kHz Dev.: ≤ 400 kHz peak	(352 to 432) MHz	0.43 %	
Rate: (100 to 200) kHz Dev.: ≤ 400 kHz peak	(352 to 432) MHz	0.56 %	

Parameter/Range	Frequency	CMC ^{2,4,6} (±)	Comments
<p>Frequency Modulation – Generate & Measure³</p> <p>Rate: 20 Hz to 10 kHz Dev.: ≤ 40 Hz peak</p> <p>Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak</p> <p>Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak</p> <p>Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz peak</p> <p>Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz peak</p>	<p>250 kHz to 10 MHz</p> <p>10 MHz to 1.3 GHz</p> <p>10 MHz to 1.3 GHz</p> <p>(1.3 to 26.5) GHz</p> <p>(1.3 to 26.5) GHz</p>	<p>2.4 % + 1 LSD</p> <p>1.3 % + 1 LSD</p> <p>5.8 % + 1 LSD</p> <p>1.3 % + 1 LSD</p> <p>5.8 % + 1 LSD</p>	<p>HP 8902A, HP 8663A</p> <p>HP 8902A, HP 11793A & HP 83630B</p>
<p>Phase Modulation – Generate & Measure³</p> <p>Rate: 200 Hz to 10 kHz Rate: 200 Hz to 20 kHz Dev.: (0.1 to 400) rad</p>	<p>150 kHz to 10 MHz</p> <p>10 MHz to 26.5 GHz</p>	<p>3.6 % + 1 LSD</p> <p>3.6 % + 1 LSD</p>	<p>HP 8902A, HP 11793A & HP 83630B</p>
<p>Phase Noise – Measure³</p> <p>Up to 26.5 GHz Carrier Frequency</p>	<p>< 1 Hz Offset</p> <p>< 10 Hz Offset</p> <p>< 100 Hz Offset</p> <p>< 1 kHz Offset</p> <p>< 3 kHz Offset</p> <p>< 5 kHz Offset</p> <p>< 10 kHz Offset</p> <p>< 100 kHz Offset</p>	<p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p> <p>1.1 dBc</p>	<p>Agilent/HP 8563E</p>



IV. Mechanical

Parameter/Equipment	Range	CMC ^{2, 6, 8} (±)	Comments
Torque – Measure ³	(5 to 50) lbf·in	0.30 %	CDI torque system
	(25 to 250) lbf·in	0.31 %	
	(100 to 1000) lbf·in	0.46 %	
	(20 to 250) lbf·ft	0.43 %	

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 5, 8} (±)	Comments
Stopwatches and Timers ³	(1 to 86 400) s	39 ms	HP 53132A/Fluke 910
Frequency – Measuring Equipment ³	DC to 1 kHz (0.001 to 20) MHz	67 nHz/Hz 31 pHz/Hz	Fluke 910 w/ HP 3325B
	10 MHz	0.12 mHz + 0.6R	Fluke 910
	20 MHz to 26.5 GHz	34 pHz/Hz	Fluke 910 w/ HP 83630B
Frequency – Measure ³	DC to 1 kHz (1 to 1000) kHz (1 to 225) MHz (0.225 to 12.4) GHz	0.12 mHz/Hz 0.30 nHz/Hz 0.12 nHz/Hz 0.12 nHz/Hz	Fluke 910 w/ HP 53131A-512
	(100 to 500) MHz (0.5 to 26.5) GHz	2.9 nHz/Hz 94 pHz/Hz	Fluke 910 w/ HP 5351B

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 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 are expressed as either a specific value that covers the full range or as a fraction of the reading plus a fixed floor specification.
- ⁵ In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches. In the statement of CMC, R is the resolution of the unit under test.
- ⁶ All CMC's listed in % are percent of reading of input unless otherwise stated.
- ⁷ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁸ 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

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for technical competence in the field of

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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 the requirements of ANSI/NCSLI Z540.3-2006 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 12th day of July 2022.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2357.03
Valid to June 30, 2024

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