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

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CALIBRATION

Valid To: July 31, 2027 Certificate Number: 3471.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations[1, 6]:

I. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Calipers[3]	Up to 12 in	7.8 µin + 5.1 µin/in	Gage blocks grade 00
Dial Indicators[3]	Up to 2 in	7.8 µin + 1.9 µin/in	Gage blocks grade 00
Micrometers[3]	Up to 24 in	7.8 µin + 5.1 µin/in	Gage blocks grade 00
Gage Blocks	Up to 0.050 in (0.050 to 4.0) in	6.6 µin 6.6 µin + 2.3 µin/in	Gage block comparator w/ gage blocks grade 00
Steel Rules, Tape Measures[3]	Up to 48 in	0.075 in	Master rule

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
DC Voltage[3] – Generate	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1000) V (0 to 120) mV (0 to 1.2) V (0 to 12) V (0 to 120) V (0 to 1020) V	0.49 µV + 5.7 nV/mV 0.8 µV + 3.5 µV/V 2.9 µV + 2.5 µV/V 4.3 µV + 2.5 µV/V 43 µV + 3.5 µV/V 0.42 mV + 4.5 µV/V 0.8 µV + 9.3 µV/V 1.9 µV + 5.8 µV/V 10 µV + 6.2 µV/V 0.1 mV + 8.5 µV/V 1 mV + 8.5 µV/V	Fluke 5720A Fluke 5560A
DC Voltage[3] – Generate, Fixed Points	1.018 V 10 V	2.6 µV 23 µV	Fluke 732B
DC Voltage[3] – Measure	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1000 to 10 000) V (1 to 45) kV (45 to 160) kV	0.24 µV + 5 nV/mV 1.1 µV + 3.7 µV/V 10 µV + 3.5 µV/V 0.88 mV + 3.2 µV/V 1.4 mV + 5.2 µV/V 0.018 % 0.13 % 0.13 %	Fluke 8508A w/ Fluke 80E-10 Ross Divider, DMM
DC Current[3] – Generate	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A (11 to 20.5) A (2 to 20) A (20 to 100) A	6 nA + 35 pA/µA 7.1 nA + 30 nA/mA 41 nA + 30 nA/mA 0.73 µA + 50 nA/mA 12 µA + 0.11 mA/A 0.49 mA + 0.34 mA/A 9.4 mA + 0.8 mA/A 13 mA + 0.13 mA/A 38 mA + 0.39 mA/A	Fluke 5720A w/ Fluke 5725A Fluke 5520A Valhalla 2555A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Current[3] – Generate (cont)	(0 to 120) µA (0 to 1.2) mA (0 to 12) mA (0 to 120) mA (0 to 1.2) A (0 to 3.1) A (0 to 12) A (0 to 30.2) A	6 nA + 97 µA/A 15 nA + 78 µA/A 82 nA + 78 µA/A 0.82 µA + 78 µA/A 10 µA + 0.12 mA/A 0.15 mA + 0.23 mA/A 0.25 mA + 0.23 mA/A 0.5 mA + 0.78 mA/A	Fluke 5560A
DC Current[3] – Measure	Up to 220 µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A	2.4 nA + 7 pA/µA 7 nA + 11 nA/mA 53 nA + 14 nA/mA 1.5 nA + 47 nA/mA 26 µA + 0.18 mA/A	Fluke 8508A

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
DC Current[3] – Measure			
Up to 15 A	DC to 60 Hz	0.0034 %	Leeds & Northrup 4360
(15 to 100) A	DC to 60 Hz	0.0037 %	Leeds & Northrup 4361
Clamp Meters[3], AC Current – Generate			
Toroidal:			
(10 to 16.5) A	(45 to 65) Hz	26 mA + 2.1 mA/A	Fluke 5520A w/ coil
(16.5 to 150) A		50 mA + 1.9 mA/A	
(150 to 1025) A		0.34 A + 1.9 mA/A	
(10 to 16.5) A	(65 to 440) Hz	60 mA + 6 mA/A	
(16.5 to 150) A		0.11 A + 5.3 mA/A	
(150 to 1025) A		0.86 A + 5.3 mA/A	
Non-Toroidal:			
(10 to 16.5) A	(45 to 65) Hz	60 mA/A + 3.8 mA/A	
(16.5 to 150) A		0.23 A + 3.7 mA/A	
(150 to 1025) A		1.2 A + 3.7 mA/A	
(10 to 16.5) A	(65 to 440) Hz	90 mA + 7.2 mA/A	
(16.5 to 150) A		0.28 A + 6.7 mA/A	
(150 to 1025) A		1.6 A + 6.7 mA/A	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Clamp Meters, DC Current – Generate	(10 to 16.5) A (16.5 to 150) A (150 to 1025) A	50 mA + 6.5 mA/A 0.18 A + 3.4 mA/A 0.83 A + 3.3 mA/A	Fluke 5520A w/ coil
Resistance[3] – Generate Fixed Points	0 Ω 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	50 μΩ 95 μΩ 0.18 mΩ 0.26 mΩ 0.48 mΩ 1.1 mΩ 2.1 mΩ 9 mΩ 17 mΩ 90 mΩ 0.17 Ω 1.1 Ω 2.1 Ω 18 Ω 36 Ω 0.36 kΩ 0.89 kΩ 10 kΩ	Fluke 5720A
	1 Ω 10 kΩ	12 μΩ 50 mΩ	Fluke 742A-1 Fluke 742A-10K
	(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	1.2 mΩ + 24 μΩ/Ω 1.5 mΩ + 24 μΩ/Ω 1.9 mΩ + 22 μΩ/Ω 4.1 mΩ + 22 μΩ/Ω 9.1 mΩ + 22 μΩ/Ω 41 mΩ + 22 μΩ/Ω 92 mΩ + 22 μΩ/Ω 0.41 Ω + 22 μΩ/Ω 0.9 Ω + 22 μΩ/Ω 8.4 Ω + 26 μΩ/Ω 14 Ω + 26 μΩ/Ω 93 Ω + 48 μΩ/Ω 0.4 kΩ + 0.1 mΩ/Ω 4.4 kΩ + 0.2 mΩ/Ω 16 kΩ + 0.4 mΩ/Ω 0.35 MΩ + 2.4 mΩ/Ω 4.4 MΩ + 12 mΩ/Ω	Fluke 5520A

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Resistance[3] – Generate Fixed Points (cont)	(0 to 12) Ω (12 to 120) Ω 120 Ω to 1.2 kΩ (1.2 to 12) kΩ (12 to 120) kΩ 120 kΩ to 1.2 MΩ (1.2 to 12) MΩ (12 to 120) MΩ (120 to 1200) MΩ	1 mΩ + 19 μΩ/Ω 1.2 mΩ + 19 μΩ/Ω 4.4 mΩ + 19 μΩ/Ω 44 mΩ + 19 μΩ/Ω 0.44 Ω + 19 μΩ/Ω 4.4 Ω + 19 μΩ/Ω 63 Ω + 27 μΩ/Ω 6.5 kΩ + 0.33 mΩ/Ω 0.47 MΩ + 3.1 mΩ/Ω	Fluke 5560A
Resistance[3] – 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	0.36 mΩ + 1.2 μΩ/Ω 58 μΩ + 8.4 μΩ/Ω 0.18 mΩ + 7.6 μΩ/Ω 1.4 mΩ + 7.8 μΩ/Ω 14 mΩ + 7.8 μΩ/Ω 0.13 Ω + 8 μΩ/Ω 1.9 Ω + 10 μΩ/Ω 0.12 kΩ + 21 μΩ/Ω 12 kΩ + 0.12 mΩ/Ω	Fluke 8508A

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Capacitance[3] – Generate, Fixed Points			
1 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.35 fF 0.36 fF 0.42 fF 0.54 fF 0.72 fF 0.95 fF 2.5 fF 3.7 fF	Agilent 16380 series capacitors
10 pF	1 kHz to 5 MHz 10 MHz 13 MHz	3.5 fF 3.7 fF 3.8 fF	
100 pF	1 kHz to 5 MHz 10 MHz 13 MHz	35 fF 48 fF 60 fF	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Capacitance[3] – Generate, Fixed Points (cont)			
1000 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.35 pF 0.35 pF 0.38 pF 0.45 pF 0.56 pF 0.71 pF 1.9 pF 2.8 pF	Agilent 16380 series capacitors
10 000 pF	120 Hz to 100 kHz	3.5 pF	
1 µF	120 Hz to 100 kHz	0.4 nF	

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Capacitance[3] – Measure 12 Hz to 100 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 (1 to 10) µF (10 to 100) µF	0.048 pF + 0.4 pF 0.22 pF 1.1 pF 40 pF 0.11 nF 1 nF 9.2 nF 0.14 µF	GenRad 1689 M CMC is only valid at 1 kHz
Capacitance[3] – Measure	1 nF to 10 mF 100 Hz to 100 kHz	See matrix below	QuadTech 7400

≤ 100 mV	Frequency				
Range	100 Hz	120 Hz	1 kHz	10 kHz	100 kHz
10 nF	3.9 %	2.8 %	0.28 %	0.13 %	0.13 %
100 nF	0.96 %	0.75 %	0.16 %	0.12 %	0.13 %
1 µF	0.51 %	0.43 %	0.15 %	0.12 %	0.17 %
10 µF	0.46 %	0.4 %	0.15 %	0.15 %	0.42 %
100 µF	0.46 %	0.4 %	0.18 %	0.35 %	3 %
1 mF	0.6 %	0.54 %	0.46 %	2.5 %	----
10 mF	1.6 %	1.6 %	3.4 %	----	----

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Capacitance[3] – Measure (cont)	1 nF to 10 mF 100 Hz to 100 kHz	See matrix below	QuadTech 7400

> 100 mV	Frequency				
Range	100 Hz	120 Hz	1 kHz	10 kHz	100 kHz
10 nF	0.95 %	0.71 %	0.087 %	0.058 %	0.059 %
100 nF	0.24 %	0.2 %	0.066 %	0.058 %	0.059 %
1 µF	0.16 %	0.14 %	0.062 %	0.058 %	0.068 %
10 µF	0.15 %	0.14 %	0.062 %	0.061 %	0.15 %
100 µF	0.15 %	0.14 %	0.072 %	0.13 %	0.96 %
1 mF	0.19 %	0.17 %	0.16 %	0.8 %	----
10 mF	0.52 %	0.51 %	1.1	----	----

Capacitance[3] – Generate			
(0.19 to 0.3999) nF	10 Hz to 10 kHz	8.7 pF + 4 pF/nF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	9.7 pF + 4 pF/nF	
(1.1 to 3.2999) nF	10 Hz to 10 kHz	13 pF + 4 pF/nF	
(3.3 to 10.9999) nF	(10 to 1000) Hz	15 pF + 2 pF/nF	
(11 to 32.9999) nF	(10 to 1000) Hz	0.1 nF + 2 pF/nF	
(33 to 109.999) nF	(10 to 1000) Hz	0.15 nF + 2 pF/nF	
(110 to 329.999) nF	(10 to 1000) Hz	0.46 nF + 2 pF/nF	
(0.33 to 1.099 99) µF	(10 to 600) Hz	1.5 nF + 2 nF/µF	
(1.1 to 3.2999) µF	(10 to 300) Hz	4.6 nF + 2 nF/µF	
(3.3 to 10.9999) µF	(10 to 150) Hz	15 nF + 2 nF/µF	
(11 to 32.9999) µF	(10 to 120) Hz	59 nF + 3.2 nF/µF	
(33 to 109.999) µF	(10 to 80) Hz	0.2 µF + 3.6 nF/µF	
(110 to 329.999) µF	Up to 50 Hz	0.64 µF + 3.6 nF/µF	
(0.33 to 1.099 99) mF	Up to 20 Hz	2 µF + 3.6 µF/mF	
(1.1 to 3.2999) mF	Up to 6 Hz	7 µF + 3.5 µF/mF	
(3.3 to 10.9999) mF	Up to 2 Hz	38 µF + 2.5 µF/mF	
(11 to 32.9999) mF	Up to 0.6 Hz	90 µF + 6 µF/mF	
(33 to 110) mF	Up to 0.2 Hz	0.37 mF + 8.8 µF/mF	
200 pF to 1.2 nF	100 Hz to 10 kHz	2.4 pF + 0.86 mF/F	Fluke 5560A
(1.2 to 12) nF	150 Hz to 5 kHz	6.2 pF + 0.9 mF/F	
(> 3 to 12) nF	(10 to 150) Hz	7.8 pF + 0.9 mF/F	
(12 to 120) nF	200 Hz to 1.3 kHz	43 pF + 1 mF/F	
(> 30 to 120) nF	(10 to 200) Hz	61 pF + 1 mF/F	
(0.12 to 1.2) µF	(2 to 310) Hz	0.42 nF + 1 mF/F	
(1.2 to 12) µF	(0.5 to 110) Hz	4.2 nF + 1 mF/F	
(12 to 120) µF	(0.5 to 40) Hz	40 nF + 1.2 mF/F	
(0.12 to 1.2) mF	(0.1 to 11) Hz	0.48 µF + 1.9 mF/F	
(1.2 to 12) mF	(0.03 to 4) Hz	5.3 µF + 1.9 mF/F	
(12 to 120) mF	(0.01 to 1.3) Hz	77 µF + 3.9 mF/F	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Inductance[3] – Measure, 12 Hz to 100 kHz	0.01 µH to 1 mH (1 to 100) mH 100 mH to 1 H (1 to 10) H	1.4 µH 0.1 mH 1.4 mH 11 mH	GenRad 1689 M CMC is only valid at 1 kHz
Inductance[3] – Generate, Fixed Points, 100 Hz to 1 kHz	100 µH 1 mH 10 mH 100 mH 1 H	6.1 nH 1 µH 9.8 µH 54 µH 0.57 mH	GenRad 1482 Series Inductors

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Inductance – Generate[3]			
(13 to 120) µH	(490 to 550) Hz (550 to 999) Hz 1 kHz (1.001 to 13) kHz (13 to 17) kHz	1.5 % 0.67 % 0.38 % 0.67 % 1.5 %	Fluke 5560A
(0.120 01 to 1.2) mH	(260 to 330) Hz (330 to 999) Hz 1 kHz (1.001 to 1.6) kHz (1.6 to 2.5) kHz	1.4 % 0.49 % 0.2 % 0.49 % 1.4 %	
(1.2001 to 3.3) mH	(0.5 to 999) Hz 110 Hz (111 to 800) Hz (800 to 980) Hz	0.74 % 0.46 % 0.74 % 1.6 %	
(3.3 to 12) mH	(0.5 to 109) Hz 110 Hz (111 to 1000) Hz (1 to 1.4) kHz	0.49 % 0.2 % 0.49 % 1.4 %	
(12 to 83) mH	(0.1 to 99) Hz 100 Hz (101 to 180) Hz (180 to 230) Hz	0.53 % 0.25 % 0.53 % 1.4 %	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
Inductance – Generate[3] (cont)			
(83 to 120) mH	(0.1 to 99) Hz 100 Hz (101 to 320) Hz (320 to 1000) Hz	0.49 % 0.2 % 0.49 % 1.4 %	Fluke 5560A
(0.120 01 to 0.65) H	(0.05 to 9.9) Hz 10 Hz (10.1 to 30) Hz (30 to 50) Hz	0.61 % 0.32 % 0.6 % 1.5 %	
(0.65 to 1.2) H	(0.05 to 9.9) Hz 10 Hz (10.1 to 100) Hz (100 to 170) Hz	0.52 % 0.24 % 0.52 % 1.4 %	
(1.2001 to 5.5) H	(0.01 to 2.99) Hz 3 Hz (3.01 to 8) Hz (8 to 16) Hz	0.68 % 0.4 % 0.68 % 1.6 %	
(5.5 to 12) H	(0.01 to 2.99) Hz 3 Hz (3.01 to 19) Hz (19 to 37) Hz	0.57 % 0.28 % 0.57 % 1.4 %	
(12.001 to 30) H	(0.005 to 1.99) Hz 2 Hz (2.01 to 4) Hz (4 to 16) Hz	0.89 % 0.61 % 0.89 % 1.8 %	
(30 to 120) H	(0.005 to 1.99) Hz 2 Hz (2.01 to 7) Hz (7 to 14) Hz	0.61 % 0.32 % 0.6 % 1.5 %	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage[3] – Generate			
220 µV 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 500 kHz to 1 MHz	4 µV + 0.22 µV/mV 4 µV + 85 nV/mV 4 µV + 75 nV/mV 4 µV + 0.18 µV/mV 5 µV + 0.46 µV/mV 10 µV + 0.9 µV/mV 20 µV + 1.2 µV/mV 20 µV + 2.5 µV/mV	Fluke 5720A
(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 500 kHz to 1 MHz	4.5 µV + 0.22 µV/mV 4.2 µV + 85 nV/mV 4.2 µV + 75 nV/mV 4.4µV + 0.18 µV/mV 6.1 µV + 0.46 µV/mV 12 µV + 0.9 µV/mV 23 µV + 1.2 µV/mV 26 µV + 2.5 µV/mV	
(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 500 kHz to 1 MHz	17 µV + 0.22 µV/mV 9 µV + 85 nV/mV 8.7 µV + 75 nV/mV 11 µV + 0.18 µV/mV 16 µV + 0.46 µV/mV 31 µV + 0.9 µV/mV 48 µV + 1.2 µV/mV 78 µV + 2.5 µV/mV	
(0.22 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 500 kHz to 1 MHz	90 µV + 0.22 mV/V 34 µV + 79 µV/V 18 µV + 39 µV/V 26 µV + 70 µV/V 54 µV + 0.11 mV/V 0.16 mV + 0.34 mV/V 0.56 mV + 0.84 mV/V 0.64 mV + 1.5 mV/V	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage[3] – Generate (cont)			
(0.22 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 500 kHz to 1 MHz	90 µV + 0.22 mV/V 34 µV + 79 µV/V 18 µV + 39 µV/V 26 µV + 70 µV/V 54 µV + 0.11 mV/V 0.16 mV + 0.34 mV/V 0.56 mV + 0.84 mV/V 0.64 mV + 1.5 mV/V	Fluke 5720A
(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 500 kHz to 1 MHz	0.89 mV + 0.22 mV/V 0.33 mV + 80 µV/V 0.15 mV + 40 µV/V 0.26 mV + 70 µV/V 0.41 mV + 95 µV/V 1.2 mV + 0.26 mV/V 4 mV + 0.9 mV/V 6.1 mV + 1.3 mV/V	
(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	8.9 mV + 0.22 mV/V 3.4 mV + 80 µV/V 1.7 mV + 47 µV/V 3.5 mV + 72 µV/V 5.9 mV + 0.13 mV/V 34 mV + 0.8 mV/V 0.13 V + 4.2 mV/V 0.24 V + 7 mV/V	* 220 V range subject to 2.2E7 V-Hz limitation
(220 to 1100) V	(15 to 50) Hz ** 50 Hz to 1 kHz 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	74 mV + 0.26 mV/V 17 mV + 60 µV/V 22 mV + 80 µV/V 34 mV + 0.13 mV/V 93 mV + 0.36 mV/V	** Max output 250 V from 15 Hz to 50 Hz w/ 5725A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	93 mV + 0.36 mV/V 0.34 V + 1.3 mV/V	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage – Generate[3]			
(1 to 12) mV	(0.01 to 3) Hz (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.11 mV + 50 mV/V 8.9 µV + 1.9 mV/V 7.7 µV + 0.68 mV/V 6.1 µV + 0.12 mV/V 6.3 µV + 0.29 mV/V 16 µV + 1.2 mV/V 36 µV + 6.2 mV/V 36 µV + 6.2 mV/V	Fluke 5560A
(12 to 120) mV	(0.01 to 3) Hz (3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	1.2 mV + 50 mV/V 30 µV + 1.9 mV/V 15 µV + 0.68 mV/V 7.4 µV + 0.11 mV/V 11 µV + 0.27 mV/V 28 µV + 0.62 mV/V 49 µV + 1.6 mV/V 49 µV + 1.6 mV/V	
(0.12 to 1.2) V	(0.01 to 3) Hz (3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	12 mV + 50 mV/V 0.3 mV + 1.9 mV/V 0.15 mV + 0.68 mV/V 74 µV + 0.11 mV/V 21 µV + 0.11 mV/V 42 µV + 0.23 mV/V 0.11 mV + 0.54 mV/V 0.26 mV + 1.5 mV/V 0.26 mV + 1.5 mV/V	
(1.2 to 12) V	(0.01 to 3) Hz (3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.12 V + 50 mV/V 3 mV + 1.9 mV/V 1.6 mV + 0.68 mV/V 0.49 mV + 0.11 mV/V 0.18 mV + 0.11 mV/V 0.33 mV + 0.23 mV/V 0.77 mV + 0.54 mV/V 2.5 mV + 1.6 mV/V 2.5 mV + 1.6 mV/V	
(12 to 120) V	(0.01 to 3) Hz (3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz *	1.2 V + 50 mV/V 30 mV + 1.9 mV/V 16 mV + 0.68 mV/V 4.8 mV + 0.11 mV/V 1.8 mV + 0.11 mV/V 3.3 mV + 0.23 mV/V 7.7 mV + 0.54 mV/V 39 mV + 1.6 mV/V	* Max output 70 V

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage – Generate[3] (cont)			
(120 to 330) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.3 V + 1.9 mV/V 0.16 V + 0.68 mV/V 21 mV + 0.11 mV/V 36 mV + 0.23 mV/V 0.16 V + 1.2 mV/V	Fluke 5560A
(330 to 1020) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 10 kHz	0.7 V + 1.9 mV/V 0.3 V + 0.68 mV/V 0.12 V + 0.11 mV/V	
AC Voltage[3] – Measure			
(20 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	14 µV + 0.16 µV/mV 4.7 µV + 0.12 µV/mV 4.9 µV + 0.1 µV/mV 2.8 µV + 0.1 µV/mV 5.9 µV + 0.13 µV/mV 10 µV + 0.31 µV/mV 25 µV + 0.66 µV/mV	Fluke 8508A
(0.2 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	0.15 mV + 0.15 mV/V 38 µV + 0.11 mV/V 36 µV + 88 µV/V 34 µV + 73 µV/V 46 µV + 0.11 mV/V 0.28 mV + 0.14 mV/V 0.3 mV + 0.51 mV/V	
(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	0.29 mV + 0.16 mV/V 0.15 mV + 0.12 mV/V 0.31 mV + 80 µV/V 0.11 mV + 74 µV/V 0.2 mV + 0.11 mV/V 0.26 mV + 0.21 mV/V 0.86 mV + 0.51 mV/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	12 mV + 0.16 mV/V 2.7 mV + 0.12 mV/V 2.7 mV + 90 µV/V 2.7 mV + 75 µV/V 3.5 mV + 0.11 mV/V 5.9 mV + 0.21 mV/V 25 mV + 0.51 mV/V	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 1 kHz	72 mV + 0.15 mV/V 29 mV + 0.11 mV/V 33 mV + 0.11 mV/V	

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
AC Voltage[3] – Measure	(1 to 30) kV (30 to 100) kV	0.59 % 0.59 %	Ross Divider, DMM
AC Current[3] – Measure			
(20 to 200) µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.23 µA + 0.14 nA/µA 20 nA + 0.48 nA/µA 21 nA + 0.62 nA/µA 25 nA + 3.1 nA/µA	Fluke 8508A
(0.2 to 2) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.42 µA + 0.25 µA/mA 0.57 µA + 0.19 µA/mA 0.27 µA + 0.62 µA/mA 0.56 µA + 3.1 µA/mA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	48 µA + 33 nA/mA 2.1 µA + 0.29 µA/mA 2.1 µA + 0.62 µA/mA 2.8 µA + 3.1 µA/mA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	25 µA + 0.29 µA/mA 21 µA + 0.28 µA/mA 21 µA + 0.58 µA/mA	
(0.2 to 2) A	(1 to 2) Hz 2 Hz to 10 kHz (10 to 30) kHz	0.41 mA + 0.05 mA/A 0.28 mA + 0.67 mA/A 0.45 mA + 2.5 mA/A	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	2.3 mA + 0.72 mA/A 2.5 mA + 1.9 mA/A	
AC Current[3] – Generate			
(0 to 220) µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	63 nA + 0.13 nA/µA 12 nA + 0.14 nA/µA 9.2 nA + 0.11 nA/µA 15 nA + 0.25 nA/µA 75 nA + 0.9 nA/µA	Fluke 5720A
(29 to 329.99) µA	(10 to 30) kHz	0.69 µA + 13 nA/µA	5520A
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	93 nA + 0.23 µA/mA 67 nA + 0.14 µA/mA 60 nA + 0.11 µA/mA 0.15 µA + 0.18 µA/mA 0.85 µA + 0.9 µA/mA	Fluke 5720A

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current[3] – Generate (cont)			
(0.33 to 3.2999) mA	(10 to 30) kHz	3.3 µA + 8 µA/mA	5520A
(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	0.92 µA + 0.23 µA/mA 0.69 µA + 0.14 µA/mA 0.6 µA + 0.11 µA/mA 0.95 µA + 0.18 µA/mA 7 µA + 0.9 µA/mA	5720
(3.3 to 32.999) mA	(10 to 30) kHz	14 µA + 3.2 µA/mA	5520A
(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	9.3 µA + 0.23 µA/mA 6.8 µA + 0.14 µA/mA 5 µA + 0.11 µA/mA 7.5 µA + 0.18 µA/mA 30 µA + 0.9 µA/mA	5720A
(33 to 329.99) mA	(10 to 30) kHz	.27 mA + 3.2 µA/mA	5520A
220 mA to 2.2 A (2.2 to 11) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	89 µA + 0.24 mA/A 0.17 mA + 0.39 mA/A 1.5 mA + 6 mA/A	Fluke 5720A
(11 to 20.5) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.1 mA + 0.4 mA/A 2.3 mA + 0.85 mA/A 8.0 mA + 3.3 mA/A	w/5725A
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	15 mA + 0.96 mA/A 17 mA + 1.2 mA/A 0.27 A + 24 mA/A	Fluke 5520A
(11 to 20) A (20 to 100) A	Up to 1 kHz	42 mA + 1.7 mA/A 0.15 A + 1.7 mA/A	Valhalla 2555A

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3]			
(12 to 120) µA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	12 nA + 0.19 mA/A 12 nA + 0.19 mA/A 12 nA + 0.19 mA/A 52 nA + 1.2 mA/A 1 µA + 3.9 mA/A	Fluke 5560A
(0.12 to 1.2) mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.13 µA + 0.19 mA/A 0.13 µA + 0.19 mA/A 0.13 µA + 0.19 mA/A 0.25 µA + 1.2 mA/A 5.5 µA + 3.9 mA/A	
(1.2 to 12) mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.3 µA + 0.19 mA/A 1.3 µA + 0.19 mA/A 1.3 µA + 0.19 mA/A 2.5 µA + 1.2 mA/A 15 µA + 3.9 mA/A	
(12 to 120) mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	13 µA + 0.19 mA/A 6.5 µA + 0.12 mA/A 10 µA + 0.19 mA/A 25 µA + 1.2 mA/A 0.15 mA + 3.9 mA/A	
(0.12 to 1.2) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.13 mA + 0.18 mA/A 75 µA + 0.19 mA/A 0.1 mA + 0.19 mA/A 0.53 mA + 1.9 mA/A 0.77 mA + 3.9 mA/A	
(1.2 to 3.1) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.85 mA + 0.29 mA/A 0.58 mA + 0.23 mA/A 0.65 mA + 0.29 mA/A 2.8 mA + 1.9 mA/A	
(3.1 to 12) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	1.9 mA + 0.29 mA/A 1.2 mA + 0.23 mA/A 1.7 mA + 0.29 mA/A 6.9 mA + 1.9 mA/A	
(12 to 30) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	19 mA + 0.78 mA/A 15 mA + 0.54 mA/A 55 mA + 3.9 mA/A	

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Oscilloscopes[3] –			
DC			
50 Ω	(0 to 6.6) V	0.84 mV + 2.4 mV/V	Fluke 5820A
1 MΩ	(0 to 6.6) V	0.95 mV + 0.25 mV/V	
Square			
50 Ω	1 mV to 6.6 Vp-p	0.72 mV + 2.4 mV/V	
1 MΩ	1 mV to 130 Vp-p	2.2 mV + 0.49 mV/V	
Fast Edge	≤ 150 ps	29 ps	
Leveled Sine Amplitude	50 kHz Reference	1.8 mV + 20 mV/V	
	10 MHz Reference	1.9 mV + 20 mV/V	
Leveled Sine Flatness			
Relative to 50 kHz	50 kHz to 100 MHz	1 mV + 38 mV/V	
	(100 to 300) MHz	0.94 mV + 45 mV/V	
	(300 to 500) MHz	0.92 mV + 65 mV/V	
	(500 to 600) MHz	0.91 mV + 72 mV/V	
Relative to 10 MHz	600 MHz to 1.1 GHz	0.97 mV + 86 mV/V	
	(1.1 to 1.6) GHz	1.2 mV + 86 mV/V	
	(1.6 to 2.1) GHz	1 mV + 0.1 V/V	
Time Marker	5 s to 50 ms	0.0012 % + 5 ns	
	20 ms to 500 ps	0.0003 %	
Distortion[3] – Measure			
(-60 to 0) dB	20 Hz to 20 kHz	1.2 dB	8903B
	(20 to 100) kHz	2.3 dB	
(-100 to 0) dB	100 kHz to 2.5 GHz	2.1 dB	8563EC
	(2.5 to 22) GHz	3.3 dB	
	(22 to 26.5) GHz	4.2 dB	

Parameter/Equipment	Range	CMC[2, 4, 5] (±)	Comments
Duty Cycle[3, 8] – Generate	(1 to 9.99) % (10 to 49.99) % 50 % (50.01 to 90) % (90.01 to 99) %	0.33 % 0.02 % 0.013 % 0.02 % 0.32 %	Fluke 5520A
Electrical Calibration of Thermocouple Indicators & Indicating Systems[3] –			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.59 °C 0.21 °C 0.17 °C 0.19 °C 0.29 °C	Martel 3001
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 0.25 °C 0.19 °C 0.2 °C 0.28 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.39 °C 0.28 °C 0.19 °C 0.32 °C 0.5 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1750) °C	0.67 °C 0.41 °C 0.39 °C 0.48 °C + 0.061 m °C/°C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1750) °C	0.65 °C 0.42 °C 0.43 °C 0.55 °C + 0.054 m °C/°C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.74 °C 0.3 °C 0.21 °C 0.16 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators & Indicating Systems[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	0.047 °C 0.058 °C 0.058 °C 0.047 °C 0.048 °C 0.061 °C + 0.016 m °C/°C 0.064 °C + 0.021 m °C/°C	Martel 3001

Parameter/Range	Frequency	CMC[2] (±)	Comments
Phase[3] (PF=1)	(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	Ø 0.1 ° Ø 0.26 ° Ø 0.51 ° Ø 2.6 ° Ø 5.1 ° Ø 10 °	Fluke 5520A
	(3 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	Ø 0.1 ° Ø 0.2 ° Ø 0.4 ° Ø 1.9 ° Ø 3.9 ° Ø 7.8 °	Fluke 5560A

Parameter/Range	Frequency		CMC[2, 4, 5] (±)		Comments	
AC Power[3] – Generate	See Table below		See Table below		Fluke 5520A	
(45 to 65) Hz	(3.366 to 33.66) W	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW	(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %		0.068 %	0.076 %	0.083 %	0.17 %
Ø 10 ° PF=0.985	0.06 %		0.075 %	0.082 %	0.088 %	0.18 %
Ø 20 ° PF=0.940	0.082 %		0.093 %	0.099 %	0.1 %	0.18 %
Ø 30 ° PF=0.866	0.11 %		0.12 %	0.13 %		0.2 %
Ø 40 ° PF=0.766	0.16 %			0.17 %		0.23 %
Ø 50 ° PF=0.643	0.21 %		0.22 %			0.27 %
Ø 60 ° PF=0.500	0.31 %					0.35 %
Ø 70 ° PF=0.342	0.48 %			0.49 %		0.51 %
Ø 80 ° PF=0.174	0.99 %					1 %
(65 to 500) Hz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW	(3.06 to 11.22) kW		(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %	0.068 %	0.076 %	0.12 %		0.21 %
Ø 10 ° PF=0.985	0.094 %	0.1 %	0.11 %	0.14 %		0.22 %
Ø 20 ° PF=0.940	0.17 %		0.18 %	0.2 %		0.26 %
Ø 30 ° PF=0.866	0.26 %			0.28 %		0.33 %
Ø 40 ° PF=0.766	0.37 %			0.39 %		0.42 %
Ø 50 ° PF=0.643	0.53 %					0.56 %
Ø 60 ° PF=0.500	0.76 %			0.77 %		0.78 %
Ø 70 ° PF=0.342	1.2 %					
Ø 80 ° PF=0.174	2.5 %					

Parameter/Range		Frequency	CMC[2, 4, 5] (±)		Comments	
AC Power – Generate[3] (cont)		See Table below	See Table below		Fluke 5560A	
500 Hz to 1 kHz	(33.66 to 336.6) W	(0.3366 to 1.122) kW	(1.122 to 3.06) kW		(3.06 to 11.22) kW	(11.22 to 20.9) kW
Ø 0 ° PF=1.000	0.052 %	0.068 %	0.076 %		0.12 %	0.21 %
(45 to 65) Hz	(1.22 to 12.2) W	(12.2 to 122) W	(0.122 to 1.22) kW	(1.22 to 3.16) kW	(3.16 to 12.2) kW	(12.2 to 30.8) kW
Ø 0 ° PF=1.000	0.038 %	0.029 %	0.034 %	0.048 %	0.04 %	0.11 %
Ø 10 ° PF=0.985	0.049 %	0.042 %	0.046 %	0.057 %	0.051 %	0.11 %
Ø 20 ° PF=0.940	0.074 %	0.07 %	0.072 %	0.079 %	0.075 %	0.12 %
Ø 30 ° PF=0.866	0.11 %					0.15 %
Ø 40 ° PF=0.766	0.15 %					
Ø 50 ° PF=0.643	0.21 %					
Ø 60 ° PF=0.500	0.3 %					
Ø 70 ° PF=0.342	0.48 %					
Ø 80 ° PF=0.174	0.99 %					
(65 to 500) Hz	(12.2 to 122) W	(0.122 to 1.22) kW	(1.22 to 3.16) kW	(3.16 to 12.2) kW	(12.2 to 30.8) kW	
Ø 0 ° PF=1.000	0.029 %	0.034 %	0.048 %	0.04 %	0.11 %	
Ø 10 ° PF=0.985	0.068 %	0.071 %	0.078 %	0.074 %	0.12 %	
Ø 20 ° PF=0.940	0.14 %				0.17 %	
Ø 30 ° PF=0.866	0.2 %		0.21 %		0.23 %	
Ø 40 ° PF=0.766	0.29 %		0.3 %		0.31 %	
Ø 50 ° PF=0.643	0.42 %					
(65 to 500) Hz	(12.2 to 122) W	(0.122 to 1.22) kW	(1.22 to 3.16) kW	(3.16 to 12.2) kW	(12.2 to 30.8) kW	
Ø 60 ° PF=0.500	0.61 %					

Parameter/Range		Frequency	CMC[2, 4, 5] (±)	Comments	
AC Power – Generate[3] (cont)		See Table below	See Table below	Fluke 5560A	
(65 to 500) Hz	(12.2 to 122) W	(0.122 to 1.22) kW	(1.22 to 3.16) kW	(3.16 to 12.2) kW	(12.2 to 30.8) kW
Ø 70 ° PF=0.342	0.96 %				
Ø 80 ° PF=0.174	2 %				
500 Hz to 1 kHz	(12.2 to 122) W	(0.122 to 1.22) kW	(1.22 to 3.16) kW	(3.16 to 12.2) kW	(12.2 to 30.8) kW
Ø 0 ° PF=1.000	0.029 %	0.034 %	0.048 %	0.04 %	0.11 %
Ø 10 ° PF=0.985	0.13 %				0.16 %
Ø 20 ° PF=0.940	0.26%				0.28 %
Ø 30 ° PF=0.866	0.41%				0.42 %
Ø 40 ° PF=0.766	0.59 %				0.6 %
Ø 50 ° PF=0.643	0.83 %				
Ø 60 ° PF=0.500	1.2 %				
Ø 70 ° PF=0.342	1.9 %				
Ø 80 ° PF=0.174	4 %				
(1 to 5) kHz	(6 to 60) W		(60 to 600) W	(0.6 to 1.55) kW	
Ø 0 ° PF=1.000	0.071 %			0.082 %	
Ø 10 ° PF=0.985	0.64 %				
Ø 20 ° PF=0.940	1.3 %				
Ø 30 ° PF=0.866	2 %				
Ø 40 ° PF=0.766	2.8 %				
Ø 50 ° PF=0.643	4 %				
(5 to 10) kHz	(3 to 30) W		(30 to 300) W		
Ø 0 ° PF=1.000	0.28 %		0.34 %		

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
AC Power – Generate[3] (cont)	See Table below	See Table below	Fluke 5560A

(5 to 10) kHz	(3 to 30) W	(30 to 300) W
Ø 10 ° PF=0.985	1.4 %	
Ø 20 ° PF=0.940	2.7 %	
Ø 30 ° PF=0.866	4.2 %	
(10 to 30) kHz	(3 to 300) W	
Ø 0 ° PF=1.000	1.1 %	
Ø 10 ° PF=0.985	3.4 %	
Ø 20 ° PF=0.940	5.9%	

Parameter/Frequency	Range	CMC[2, 4, 5] (±)	Comments
DC Power[3] – Generate	Up to 1020 V		
Up to 330 µA	Up to 337 mW	0.017 %	Fluke 5520A
Up to 3.3 mA	(0.337 to 3.366) W	0.021 %	
Up to 33 mA	(3.366 to 33.66) W	0.0093 %	
Up to 330 mA	(33.66 to 336.6) W	0.0093 %	
Up to 1.1 A	(0.3366 to 1.122) kW	0.019 %	
Up to 3 A	(1.122 to 3.06) kW	0.043 %	
Up to 11 A	(3.06 to 11.22) kW	0.044 %	
Up to 20.5 A	(11.22 to 20.91) kW	0.13 %	
Up to 120 µA	Up to 122 mW	0.015 %	Fluke 5560A
Up to 1.2 mA	(0.12 to 1.224) W	0.0092 %	
Up to 12 mA	(1.225 to 12.24) W	0.0087 %	
Up to 120 mA	(12.24 to 122.4) W	0.0087 %	
Up to 1.2 A	(0.1224 to 1.224) kW	0.013 %	
Up to 3.1 A	(1.224 to 3.162) kW	0.028 %	
Up to 12 A	(3.162 to 12.24) kW	0.025 %	
Up to 30.2 A	(12.24 to 30.8) kW	0.08 %	

III. RF/Microwave

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Power Meter[3]			
Power Reference @ 1 mW	50 MHz	0.60 %	Agilent 432A, 8478B, Agilent 3458A
Power Accuracy	3 µW to 100 mW	0.29 %	Range calibrator
Relative Power[3] – Measure			
(0 to -10) dB	2.5 MHz to 1.3 GHz	0.047 dB	8902A
(-10 to -20) dB		0.06 dB	
(-20 to -30) dB		0.074 dB	
(-30 to -40) dB		0.087 dB	
(-40 to -50) dB		0.1 dB	
(-50 to -60) dB		0.1 dB	
(-60 to -70) dB		0.11 dB	
(-70 to -80) dB		0.12 dB	
(-80 to -90) dB		0.13 dB	
(-90 to -100) dB		0.15 dB	
(-100 to -110) dB		0.15 dB	
(-110 to -120) dB		0.28 dB	
(-120 to -127) dB		0.29 dB	
(0 to -10) dB	(1.3 to 26.5) GHz	0.066 dB	
(-10 to -20) dB		0.06 dB	
(-20 to -30) dB		0.074 dB	
(-30 to -40) dB		0.087 dB	
(-40 to -50) dB		0.1 dB	
(-50 to -60) dB		0.1 dB	
(-60 to -70) dB		0.11 dB	
(-70 to -80) dB		0.12 dB	
(-80 to -90) dB		0.13 dB	
(-90 to -100) dB		0.15 dB	
(-100 to -110) dB		0.15 dB	
(-110 to -120) dB		0.28 dB	
(-120 to -127) dB		0.29 dB	

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Absolute Power[3] – Measure			Agilent E4418B w/
(0 to +20) dBm (-10 to 0) dBm (-60 to -10) dBm	9 kHz to 6 GHz	2.9 % 3.3 % 3.9 %	Agilent E9304A
(+10 to +20) dBm	100 kHz to 4.2 GHz (4.2 to 26.5) GHz	1.1 % 3.2 %	Agilent 8482A Agilent 8485A
(-30 to +10) dBm	100 kHz to 4.2 GHz (4.2 to 26.5) GHz	3.6 % 4.7 %	Agilent 8482A Agilent 8485A
Amplitude Modulation[3] – Measure			
Rate: 50 Hz to 10 kHz Depths: (5 to 99) %	150 kHz to 10 MHz	0.14 % depth + 0.024 % depth/% depth	8902A
Rate: 20 Hz to 10 kHz Depths: to 99 %	150 kHz to 10 MHz	0.11 % depth + 0.023 % depth/% depth	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(0.01 to 1.3) GHz	0.15 % depth + 0.01 % depth/% depth	
Rate: 20 Hz to 100 kHz Depths: to 99 %	(0.01 to 1.3) GHz	0.11 % depth + 0.023 % depth/% depth	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(1.3 to 26.5) GHz	0.33 % depth + 0.008 % depth/% depth	
Rate: 20 Hz to 100 kHz Depths: to 99 %	(1.3 to 26.5) GHz	0.31 % depth + 0.021 % depth/% depth	
Frequency Modulation[3] – Measure			
Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz Peak	250 kHz to 10 MHz	3.5 Hz + 16 Hz/kHz	8902A
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz Peak	(0.01 to 1.3) GHz	3.5 Hz + 7.8 Hz/kHz	
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz Peak	(0.01 to 1.3) GHz	6.8 Hz + 39 Hz/kHz	

Parameter/Range	Frequency	CMC[2, 4, 5] (±)	Comments
Frequency Modulation[3] – Measure (cont)			
Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz Peak	(1.3 to 26.5) GHz	6.8 Hz + 7.8 Hz/kHz	8902A
Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz Peak	(1.3 to 26.5) GHz	6.8 Hz + 39 Hz/kHz	
Phase Modulation[3] – Measure			
Rate: 200 Hz to 10 kHz (0 to 100) rad	150 kHz to 10MHz	36 mrad + 37 mrad/rad	8902A
Rate: 200 Hz to 20 kHz (0 to 100) rad	(0.01 to 1.3) GHz	36 mrad + 37 mrad/rad	
Rate: 200 Hz to 20 kHz (0 to 100) rad	(1.3 to 26.5) GHz	36 mrad + 37 mrad/rad	
Power Sensor Calibration Factor	9 kHz to 10 MHz 10 MHz to 2 GHz (2 to 3.6) GHz (3.6 to 4.6) GHz (4.6 to 9) GHz (9 to 11.8) GHz (11.8 to 16.25) GHz (16.25 to 18) GHz	1.7 % 0.57 % 0.59 % 0.61 % 0.65 % 0.74 % 0.78 % 0.94 %	Power sensor calibration system w/ Tegam 1805B power meter, Agilent E9304A, F1109 power reference
Displayed Average Noise Level[3, 8]	DC to 2 GHz (> 2 to ≤ 3) GHz (> 3 to ≤ 6) GHz	0.39 dB 0.16 dB 0.3 dB	50 Ω termination

Parameter/Range	Frequency	CMC[2] (±)	Comments
S-Parameters (Reflection & Transmission)	300 kHz to 6 GHz	See tables below *(Interpolate CMC's between cardinal points listed)*	Network analyzers with calibration/ verification kits

Type N: Reflection S_{11}/S_{22} Linear Magnitude (ρ)			E5071C with 85032B
rho	300 kHz to 10 MHz	10 MHz to 3 GHz	(3 to 6) GHz
0	0.0039	0.0052	0.011
0.1	0.0046	0.0061	0.012
0.2	0.0054	0.0073	0.014
0.3	0.0064	0.0086	0.017
0.4	0.0074	0.01	0.02
0.5	0.0086	0.012	0.024
0.6	0.01	0.015	0.028
0.7	0.012	0.017	0.033
0.8	0.013	0.02	0.038
0.9	0.015	0.023	0.044
1.0	0.017	0.026	0.05
Type N: Reflection S_{11}/S_{22} Phase (0 to 180)°			E5071C with 85032B
rho	300 kHz to 10 MHz	10 MHz to 3 GHz	(3 to 6) GHz
0	----	----	----
0.1	2.6	3.4	7
0.2	1.5	2.1	4.1
0.3	1.2	1.6	3.2
0.4	1.1	1.5	2.9
0.5	0.99	1.4	2.7
0.6	0.95	1.4	2.7
0.7	0.95	1.4	2.7
0.8	0.95	1.4	2.7
0.9	0.96	1.5	2.8
1.0	0.98	1.5	2.9
Type N: Transmission S_{12}/S_{21} Linear Magnitude (dB)			E5071C with 85032B
dB	300 kHz to 10 MHz	10 MHz to 3 GHz	(3 to 6) GHz
-90	8	2.6	2.7
-80	3.4	1	1
-70	1.3	0.42	0.47
-60	0.45	0.23	0.28
-50	0.19	0.16	0.21
-40	0.12	0.12	0.18
-30	0.088	0.097	0.15
-20	0.067	0.076	0.13

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
S-Parameters (Reflection & Transmission)	300 kHz to 6 GHz	See tables below *(Interpolate CMC's between cardinal points listed)*	Network analyzers with calibration/ verification kits

Type N: Transmission S_{12}/S_{21} Linear Magnitude (dB)			E5071C with 85032B
dB	300 kHz to 10 MHz	10 MHz to 3 GHz	(3 to 6) GHz
-10	0.056	0.066	0.12
0	0.046	0.056	0.11
10	0.063	0.073	0.13
Type N: Transmission S_{12}/S_{21} Phase (0 to 180)°			E5071C with 85032B
dB	300 kHz to 10 MHz	10 MHz to 3 GHz	(3 to 6) GHz
-90	----	21	21
-80	29	7.1	7.4
-70	8.9	2.9	3.2
-60	3	1.5	1.9
-50	1.3	1	1.4
-40	0.79	0.81	1.2
-30	0.59	0.65	1
-20	0.45	0.51	0.88
-10	0.38	0.44	0.82
0	0.32	0.38	0.76
10	0.45	0.52	0.9

Attenuation[3] – Generate			
(1 to 11) dB	DC to 8 GHz (8 to 12.4) GHz (12.4 to 18) GHz	0.22 dB 0.29 dB 0.51 dB	Agilent 8494H
(12 to 121) dB	DC to 8 GHz	0.22 dB + 0.0011 x ΔA Change from 12 dB	Agilent 8494H, 8496H
	(8 to 12.4) GHz	0.28 dB + 0.001 x ΔA Change from 12 dB	
	(12.4 to 18) GHz	0.51 dB + 0.0006 x ΔA Change from 12 dB	

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
Scales[3]	Up to 400 lbs	0.82 x *R*	Class F weights
Balances[3]			
0.0001 g Resolution	(5 to 500) mg > 500 mg to 5 g > 5 g to 6 kg	0.82 x *R* 0.91 x *R* 1.0 x *R*	Class 1, 3 & 4 weights
0.001 g Resolution	5 mg to 10 g (> 10 to 50) g > 50 g to 6 kg	0.82 x *R* 0.91 x *R* 1.4 x *R*	
0.01 g Resolution	5 mg to 300 g > 300 g to 6 kg	0.82 x *R* 1.4 x *R*	
0.1 g Resolution	5 mg to 2 kg (2 to 6) kg	0.85 x *R* 1.0 x *R*	
1 g & 10 g Resolution	5 mg to 6 kg	0.82 x *R*	
Pressure –Measuring Equipment[3]	(-1 to 0) psig (0 to 1) psig (0 to 15) psig (15 to 30) psig (30 to 500) psig (500 to 3000) psig (3000 to 5000) psig	0.013 psi + 0.6 *R* 0.012 psi 0.052 psi 0.034 psi 0.44 psi 0.85 psi 3 psi	Pressure modules
	(0 to 1) inH_2O	0.001 inH_2O	Druck DPI 610 pressure calibrator
Torque Tools – Wrenches, Gages & Drivers[3]	(0.5 to 5) lbf·in (5 to 50) lbf·in (50 to 400) lbf·in (400 to 1000) lbf·in (83 to 600) lbf·ft	0.58 % 0.58 % 0.29 % 0.3 % 0.29 %	Torque testers
Torque – Measuring Equipment[3]	5 ozf·in to 10 lbf·in (10 to 1000) lbf·in	0.05 % 0.036 %	Torque arms & Class 4 & Class F weights

V. Thermodynamics

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Relative Humidity – Measuring Equipment[3]	11 %, 33 %, 75 %	1.4 % RH	Saturated salts/ Vaisala MI 70, HMP 77B
Relative Humidity – Measure[3]	(20 to 80) % RH	1.4 % RH	Vaisala MI 70, HMP 77B
Temperature – Measuring Equipment[3] Digital & Analog Thermometers	(-25 to 140) °C (140 to 660) °C	0.06 °C 0.1 °C	Accumac 1751 PRT, 8508A, Calibration Baths & Wells
Temperature – Measure[3] Fridges, Freezers, Chambers, Thermal Baths	(-196 to 660) °C	0.011 °C + ΔT(Change from -196 °C) x 0.000 003	Accumac AM 1751/ w 8508A
Infrared Temperature – Measuring Equipment[3]	(35 to 500) °C	0.54 °C + $\Delta T_{(\text{Change from 35 °C})}$ x 0.0042	Fluke 4181 Ɛ = 0.9 to 1 λ = (8 to 14) µm

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency	10 MHz	12 µHz	58503A GPS Receiver
Frequency – Measuring Equipment[3]	100 mHz to 20 MHz 20 MHz to 50 GHz	55 µHz + 26 pHz/Hz 0.58 mHz + 1 pHz/Hz	3325B function generator E8257D signal generator

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency – Measure[3]	0.1 Hz to 3 GHz	5.8 µHz + 59 pHz/Hz	53131A frequency counter
	(3 to 26.5) GHz	0.11 Hz + 0.36 pHz/Hz	5351B microwave counter
	(26.5 to 50) GHz	0.12 Hz + 0.53 pz/Hz	E4448A spectrum analyzer
Stopwatches & Timers	± (0 to 19.99) sec/day	0.037 sec/day	Helmut Klein 4500 Timometer

[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. CMCs are expressed as either a specific value that covers the full range or as a percentage or fraction of the reading plus a fixed floor specification.

[5] In the statement of CMC, percentages are to be read as percent of reading unless otherwise noted. In the statement of CMC, R represents the resolution of the unit under test, L is the numerical value of the length of the device measured in inches.

[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

TRESCAL, INC.

Bohemia, NY

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 18th day of July 2025.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3471.01
Valid to July 31, 2027

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