



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

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CALIBRATION

Valid To: June 30, 2026

Certificate Number: 2357.07

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations<sup>1,8</sup>:

I. Dimensional

Parameter/Equipment	Range	CMC <sup>2,5</sup> ( $\pm$ )	Comments
Calipers <sup>3</sup>	Up to 4 in (>4 to 12) in (>12 to 72) in	(58 + 0.25L) $\mu$ in (59 + 1.6L) $\mu$ in (72 + 2.1L) $\mu$ in	Gage blocks, surface plate
Height Gages <sup>3</sup>	Up to 4 in (>4 to 12) in (>12 to 48) in	(58 + 0.25L) $\mu$ in (54 + 1.6L) $\mu$ in (47 + 2.1L) $\mu$ in	Gage blocks, surface plate
Indicators <sup>3</sup>	Up to 0.2 in (0.2 to 4) in	37 $\mu$ in (13 + 0.76L) $\mu$ in	P&W Supermicrometer <sup>TM</sup> , gage blocks

Parameter/Equipment	Range	CMC <sup>2,5</sup> (±)	Comments
Micrometers <sup>3</sup> –			
Length	Up to 4 in (>4 to 12) in (>12 to 72) in	(7.4 + 1.1L) μin (12 + 4.8L) μin (64 + 21L) μin	Gage blocks, surface plate
Flatness	Up to 1 in	3.0 μin	
Parallelism	Up to 1 in	8.3 μin	
Surface Plates <sup>3</sup> –			
Repeatability Flatness	Up to 96 x 96 in (24 x 24 to 72 x 144) in	28 μin (6.6 + 2.0D) μin	Repeat-o-meter, differential leveling system, <i>D</i> is the diagonal length in inches

## II. Electrical – DC/Low Frequency

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Current – Generate <sup>3</sup>			
(1 to 220) μA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.48 mA/A + 16 nA 0.28 mA/A + 10 nA 0.25 mA/A + 8.0 nA 0.36 mA/A + 12 nA 1.1 mA/A + 65 nA	Fluke 5720A
(0.22 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	0.43 mA/A + 65 nA 0.21 mA/A + 35 nA 0.18 mA/A + 35 nA 0.24 mA/A + 0.11 μA 1.0 mA/A + 0.65 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	0.42 mA/A + 0.40 μA 0.21 mA/A + 0.35 μA 0.14 mA/A + 0.35 μA 0.21 mA/A + 0.55 μA 1.0 mA/A + 5.0 μA	

Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
AC Current – Generate <sup>3</sup> (cont)			
(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	0.42 mA/A + 4.0 µA 0.19 mA/A + 3.5 µA 0.13 mA/A + 2.5 µA 0.20 mA/A + 3.5 µA 1.0 mA/A + 10 µA	Fluke 5720A
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.29 mA/A + 35 µA 0.42 mA/A + 80 µA 6.3 mA/A + 0.16 mA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.37 mA/A + 0.17 mA 0.76 mA/A + 0.38 mA 2.8 mA/A + 0.75 mA	Fluke 5720A w/ 5725A
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.81 mA/A + 3.9 mA 1.0 mA/A + 3.9 mA 19 mA/A + 3.9 mA	Fluke 5520A
Toroidal Type Clamps			
(20 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.47 % 0.89 %	Fluke 5520A w/ coil
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.46 % 0.88 %	
Non-Toroidal Type Clamps			
(20 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.81 % 1.2 %	
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	1.2 % 1.6 %	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Current – Measure <sup>3</sup>			
Up to 199.99 µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.81 mA/A + 20 nA 1.9 mA/A + 20 nA 1.9 mA/A + 20 nA 4.4 mA/A + 20 nA	Fluke 8508A, opt 01
(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 4.4 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	0.60 mA/A + 2.0 µA 1.5 mA/A + 2.0 µA 1.7 mA/A + 2.0 µA 5.7 mA/A + 2.0 µA	
(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	
(0.2 to 1.9999) A	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.70 mA/A + 0.20 mA 6.1 mA/A + 0.20 mA 6.8 mA/A + 0.20 mA	
(2 to 19.999) A	10 Hz to 2 kHz (2 to 10) kHz	0.98 mA/A + 2.0 mA 4.5 mA/A + 2.0 mA	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup>			
(0.2 to 2.2) mV	(10 to 20) Hz	1.1 mV/V + 3.9 μV	Fluke 5720A
	(20 to 40) Hz	1.1 mV/V + 3.9 μV	
	40 Hz to 20 kHz	1.1 mV/V + 3.9 μV	
	(20 to 50) kHz	1.4 mV/V + 3.9 μV	
	(50 to 100) kHz	2.1 mV/V + 4.7 μV	
	(100 to 300) kHz	3.5 mV/V + 9.3 μV	
	(300 to 500) kHz	5.2 mV/V + 19 μV	
	(0.5 to 1) MHz	6.6 mV/V + 19 μV	
(2.2 to 22) mV	(10 to 20) Hz	0.38 mV/V + 3.9 μV	
	(20 to 40) Hz	0.23 mV/V + 3.9 μV	
	40 Hz to 20 kHz	0.18 mV/V + 3.9 μV	
	(20 to 50) kHz	0.31 mV/V + 3.9 μV	
	(50 to 100) kHz	0.68 mV/V + 4.7 μV	
	(100 to 300) kHz	1.3 mV/V + 9.3 μV	
	(300 to 500) kHz	1.7 mV/V + 19 μV	
	(0.5 to 1) MHz	3.2 mV/V + 19 μV	
(22 to 220) mV	(10 to 20) Hz	0.41 mV/V + 12 μV	
	(20 to 40) Hz	0.12 mV/V + 6.2 μV	
	40 Hz to 20 kHz	88 μV/V + 6.2 μV	
	(20 to 50) kHz	0.20 mV/V + 6.2 μV	
	(50 to 100) kHz	0.49 mV/V + 16 μV	
	(100 to 300) kHz	0.88 mV/V + 19 μV	
	(300 to 500) kHz	1.4 mV/V + 23 μV	
	(0.5 to 1) MHz	2.7 mV/V + 47 μV	
(0.22 to 2.2) V	(10 to 20) Hz	0.52 mV/V + 39 μV	
	(20 to 40) Hz	0.10 mV/V + 16 μV	
	40 Hz to 20 kHz	50 μV/V + 7.8 μV	
	(20 to 50) kHz	79 μV/V + 9.3 μV	
	(50 to 100) kHz	0.14 mV/V + 31 μV	
	(100 to 300) kHz	0.44 mV/V + 78 μV	
	(300 to 500) kHz	0.96 mV/V + 0.19 mV	
	(0.5 to 1) MHz	1.7 mV/V + 0.31 mV	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
(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	0.41 mV/V + 0.39 mV 0.11 mV/V + 0.16 mV 48 μV/V + 54 μV 83 μV/V + 93 μV 0.12 mV/V + 0.19 mV 0.30 mV/V + 0.62 mV 0.98 mV/V + 1.9 mV 1.7 mV/V + 3.1 mV	Fluke 5720A
(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	0.47 mV/V + 3.9 mV 0.12 mV/V + 1.6 mV 57 μV/V + 0.54 mV 95 μV/V + 0.93 mV 0.16 mV/V + 2.3 mV 1.0 mV/V + 16 mV 4.4 mV/V + 39 mV 9.5 mV/V + 78 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.28 mV/V + 16 mV 77 μV/V + 3.1 mV	
(220 to 1100) V	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	74 μV/V + 3.1 mV 0.13 mV/V + 4.7 mV 0.47 mV/V + 8.5 mV	
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.47 mV/V + 8.5 mV 1.8 mV/V + 35 mV	Fluke 5720A w/5725A

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
Wideband – opt 003	Absolute:		
Up to 1.1 mV	30 Hz to 500 kHz	6.4 mV/V + 1.6 μV	Fluke 5720A wideband output
(1.1 to 3) mV	30 Hz to 500 kHz	5.5 mV/V + 2.3 μV	
(3 to 11) mV	30 Hz to 500 kHz	5.5 mV/V + 6.2 μV	
(11 to 33) mV	30 Hz to 500 kHz	4.7 mV/V + 12 μV	
(33 to 110) mV	30 Hz to 500 kHz	4.7 mV/V + 31 μV	
(110 to 330) mV	30 Hz to 500 kHz	3.9 mV/V + 78 μV	
330 mV to 1.1 V	30 Hz to 500 kHz	3.9 mV/V + 0.31 mV	
(1.1 to 3.5) V	30 Hz to 500 kHz	3.1 mV/V + 0.39 mV	
	Flatness:		
Up to 1.1 mV	(10 to 30) Hz	2.4 mV/V	
	30 Hz to 120 kHz	0.98 mV/V	
	(0.12 to 2) MHz	2.2 mV/V + 2.3 μV	
	(2 to 10) MHz	3.7 mV/V + 2.3 μV	
	(10 to 20) MHz	5.5 mV/V + 2.3 μV	
	(20 to 30) MHz	13 mV/V + 12 μV	
(1.1 to 3) mV	(10 to 30) Hz	2.4 mV/V	
	30 Hz to 120 kHz	0.94 mV/V	
	(0.12 to 2) MHz	1.3 mV/V + 2.3 μV	
	(2 to 10) MHz	2.2 mV/V + 2.3 μV	
	(10 to 20) MHz	4.7 mV/V + 2.3 μV	
	(20 to 30) MHz	12 mV/V + 2.3 μV	
(3 to 11) mV	(10 to 30) Hz	2.4 mV/V	
	30 Hz to 120 kHz	0.94 mV/V	
	(0.12 to 2) MHz	1.1 mV/V + 2.3 μV	
	(2 to 10) MHz	2.0 mV/V + 2.3 μV	
	(10 to 20) MHz	4.0 mV/V + 2.3 μV	
	(20 to 30) MHz	8.7 mV/V + 2.3 μV	
(11 to 33) mV	(10 to 30) Hz	2.4 mV/V	
	30 Hz to 120 kHz	0.91 mV/V	
	(0.12 to 2) MHz	1.0 mV/V + 2.3 μV	
	(2 to 10) MHz	2.0 mV/V + 2.3 μV	
	(10 to 20) MHz	3.8 mV/V + 2.3 μV	
	(20 to 30) MHz	8.5 mV/V + 2.3 μV	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
Wideband – Opt 003			
(33 to 110) mV	(10 to 30) Hz 30 Hz to 120 kHz (0.12 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	2.4 mV/V 0.87 mV/V 1.0 mV/V + 2.3 μV 2.0 mV/V + 2.3 μV 3.8 mV/V + 2.3 μV 8.1 mV/V + 2.3 μV	Fluke 5720A wideband output
(110 to 330) mV	(10 to 30) Hz 30 Hz to 120 kHz (0.12 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	2.3 mV/V 0.84 mV/V 1.0 mV/V + 2.3 μV 2.0 mV/V + 2.3 μV 3.8 mV/V + 2.3 μV 8.5 mV/V + 2.3 μV	
330 mV to 1.1 V	(10 to 30) Hz 30 Hz to 120 kHz (0.12 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	2.3 mV/V 0.84 mV/V 1.0 mV/V + 2.3 μV 2.0 mV/V + 2.3 μV 3.8 mV/V + 2.3 μV 8.5 mV/V + 2.3 μV	
(1.1 to 3.5) V	(10 to 30) Hz 30 Hz to 120 kHz (0.12 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	2.5 mV/V 0.84 mV/V 1.0 mV/V + 2.3 μV 2.0 mV/V + 2.3 μV 3.8 mV/V + 2.3 μV 8.5 mV/V + 2.3 μV	



Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup>			
(Up to 199.99) mV	(1 to 10) Hz (10 to 40) Hz 40 Hz to 100 kHz (0.1 to 2) kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.64 mV/V + 14 µV 0.23 mV/V + 4.0 µV 0.21 mV/V + 4.0 µV 0.2 mV/V + 2.0 µV 0.22 mV/V + 4.0 µV 0.44 mV/V + 8 µV 1 mV/V + 20 µV	Fluke 8508A
(0.2 to 1.9999) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 100 kHz (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 + 0.12 mV 0.16 mV/V + 20 µV 0.15 mV/V + 20 µV 92 µV/V + 20 µV 0.12 mV/V + 20 µV 0.24 mV/V + 40 µV 0.61 mV/V + 0.2 mV 3 mV/V + 2 mV 10 mV/V + 20 mV	
(2 to 19.999) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 100 kHz (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	0.69 mV/V + 1.2 mV 0.31 mV/V + 0.20 mV 0.1 mV/V + 0.20 mV 91 µV/V + 0.20 mV 0.12 mV/V + 0.20 mV 0.24 mV/V + 0.40 mV 0.58 mV/V + 2 mV 3 mV/V + 20 mV 10 mV/V + 0.2 V	
(20 to 199.9) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 100 kHz (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	0.82 mV/V + 12 mV 0.3 mV/V + 2 mV 0.11 mV/V + 2 mV 96 µV/V + 2 mV 0.13 mV/V + 2 mV 0.24 mV/V + 4.0 mV 0.6 mV/V + 20 mV 3 mV/V + 0.2 V 10 mV/V + 2 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	0.32 mV/V + 70 mV 0.32 mV/V + 20 mV 0.15 mV/V + 20 mV 0.36 mV/V + 40 mV 0.64 mV/V + 0.2 V	
(>1 to 10) kV (>10 to 70) kV	(50/60, 400) Hz (50/60, 100) Hz	1.5 mV/V + 0.12 V 3.1 mV/V + 0.69 V	Vitrek 4700 Vitrek 4700 w/ HVL-100

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
Oscilloscopes <sup>3</sup> –			
Amplitude – DC Signal Into 50 Ω Load Into 1 MΩ Load	±1 mV to 6.6 V <sub>pp</sub> ±1 mV to 130 V <sub>pp</sub>	1.9 mV/V + 31 μV 0.39 mV/V + 31 μV	Fluke 5520A/SC1100
Amplitude – Square Wave Into 50 Ω Load	±1 mV to 6.6 V <sub>pp</sub> 10 Hz to 100 kHz	2.0 mV/V + 31 μV	
Into 1 MΩ Load	±1 mV to 130 V <sub>pp</sub> 10 Hz to 100 kHz	0.78 mV/V + 31 μV	
Leveled Sine Wave – Flatness 5 mV to 5.5 V 5 mV to 3.5 V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	3.0 % + 78 μV 3.4 % + 78 μV 4.3 % + 78 μV 4.9 % + 78 μV	
Time Marker	5 s to 50 ms 1 ns to 20 ms: (Cardinal points) (Noncardinal points)	7.8 ms/s + 0.0019 % 6.2 μs/s 39 μs/s	Fluke 5520A SC1100  Tektronix 11801B w/ SD-24
Rise Time – Generate	(200 to 350) ps, 1 kHz to 10 MHz	33 ps	
Rise Time – Measure	(17.5 to 350) ps: (Positive) (Negative)	4.6 ps 5.2 ps	
Distortion <sup>3</sup> – Measure  (–99.99 to 0) dB	20 Hz to 20 kHz (20 to 100) kHz	1.2 dB 2.4 dB	HP 8903B

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
DC Current – Generate <sup>3</sup>	Zero	1.5 pA	OPEN
	0.1 nA 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 11) A	51 μA/A + 5.4 nA 42 μA/A + 6.2 nA 42 μA/A + 39 nA 48 μA/A + 0.62 μA 76 μA/A + 12 μA 0.28 mA/A + 0.37 mA	Fluke 5720A opt 3 w/ 5725A
Clamp-On Only	(11 to 20.5) A	0.78 mA/A + 0.58 mA	Fluke 5520A
	(20 to 149.999) A (150 to 1025) A	4.4 mA/A + 0.11 A 4.3 mA/A + 0.39 A	Fluke 5520A w/ 5500A coil
DC Current – Measure <sup>3</sup>	Zero	1.5 pA	Keysight 3458A
	(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	46 μA/A + 0.40 nA 32 μA/A + 4.0 nA 34 μA/A + 40 nA 56 μA/A + 0.80 μA 0.20 mA/A + 16 μA 0.44 mA/A + 0.40 mA	Fluke 8508A
	(1 to 20) A (20 to 300) A	18 μA/A 54 μA/A	Guildline 9211
	DC Resistance – Measure <sup>3</sup>	(0 to 2) Ω (2 to 20) Ω (20 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	22 μΩ/Ω + 4.0 μΩ 15 μΩ/Ω + 14 μΩ 12 μΩ/Ω + 50 μΩ 11 μΩ/Ω + 0.50 mΩ 9.3 μΩ/Ω + 5.0 mΩ 11 μΩ/Ω + 50 mΩ 19 μΩ/Ω + 1.0 Ω 20 μΩ/Ω + 10 Ω 77 μΩ/Ω + 1.0 kΩ 0.22 mΩ/Ω + 0.10 MΩ 1.5 mΩ/Ω + 10 MΩ
(0.2 to 2) GΩ (2 to 20) GΩ (20 to 200) GΩ (0.2 to 2) TΩ (2 to 20) TΩ		0.26 % + 12 kΩ 0.26 % + 120 kΩ 0.41 % + 1.2 MΩ 0.50 % + 12 MΩ 1.4 % + 120 MΩ	Normal mode High voltage mode
			Keithley 6517A

Parameter/Range	Range	CMC <sup>2,4</sup> (±)	Comments
DC Resistance –Generate <sup>3</sup>	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (330 to 1099.999) Ω (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 (330 to 1099.999) kΩ (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 1099.999) MΩ	46 μΩ/Ω + 0.78 mΩ 52 μΩ/Ω + 1.2 mΩ 34 μΩ/Ω + 1.1 mΩ 29 μΩ/Ω + 1.6 mΩ 27 μΩ/Ω + 1.6 mΩ 28 μΩ/Ω + 16 mΩ 27 μΩ/Ω + 16 mΩ 29 μΩ/Ω + 0.16 Ω 27 μΩ/Ω + 0.16 Ω 25 μΩ/Ω + 1.6 Ω 26 μΩ/Ω + 1.6 Ω 49 μΩ/Ω + 23 Ω 0.11 mΩ/Ω + 39 Ω 0.20 mΩ/Ω + 1.9 kΩ 0.40 mΩ/Ω + 2.3 kΩ 2.4 mΩ/Ω + 78 kΩ 12 mΩ/Ω + 0.39 MΩ	Fluke 5520A
DC Resistance – Generate <sup>3</sup> 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 0.23 mΩ 0.42 mΩ 1.1 mΩ 2 mΩ 8.2 mΩ 16 mΩ 82 mΩ 0.15 Ω 1 Ω 2.7 Ω 50 Ω 60 Ω 4 kΩ 8.5 kΩ 26 kΩ	Fluke 5720A

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
DC Voltage – Measure <sup>3</sup>	Zero	7.6 nV	Fluke 8508A w/ copper short
	Up to 200 mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1050) V  (1 to 10) kV (10 to 100) kV	6.4 μV/V + 100 nV 3.6 μV/V + 0.40 μV 3.5 μV/V + 4.0 μV 5.9 μV/V + 40 μV 7.5 μV/V + 0.53 mV  0.35 mV/V + 35 mV 0.84 mV/V + 0.35 V	Fluke 8508A, opt 01  Vitrek 4700 Vitrek 4700 w/ HVL-100
DC Voltage – Generate <sup>3</sup>	Zero	7.6 nV	Copper short
	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V 220 V to 1.1 kV	11 μV/V + 0.39 μV 4.9 μV/V + 0.62 μV 3.5 μV/V + 2.3 μV 3.6 μV/V + 3.9 μV 5.0 μV/V + 39 μV 6.4 μV/V + 0.39 mV	Fluke 5720A
Electrical Calibration of Thermocouple Indicators <sup>3</sup> –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.34 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5520A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.24 °C 0.21 °C 0.25 °C 0.39 °C 0.65 °C	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators <sup>3</sup> – (cont)			
Type E	(-250 to -100) °C	0.39 °C	Fluke 5520A
	(-100 to -25) °C	0.13 °C	
	(-25 to 350) °C	0.11 °C	
	(350 to 650) °C	0.13 °C	
	(650 to 1000) °C	0.17 °C	
Type J	(-210 to -100) °C	0.25 °C	
	(-100 to -30) °C	0.13 °C	
	(-30 to 150) °C	0.12 °C	
	(150 to 760) °C	0.14 °C	
	(760 to 1200) °C	0.18 °C	
Type K	(-200 to -100) °C	0.26 °C	
	(-100 to -25) °C	0.14 °C	
	(-25 to 120) °C	0.13 °C	
	(120 to 1000) °C	0.20 °C	
	(1000 to 1372) °C	0.31 °C	
Type N	(-200 to -100) °C	0.31 °C	
	(-100 to -25) °C	0.17 °C	
	(-25 to 120) °C	0.15 °C	
	(120 to 410) °C	0.14 °C	
	(410 to 1300) °C	0.21 °C	
Type R	(0 to 250) °C	0.45 °C	
	(250 to 400) °C	0.28 °C	
	(400 to 1000) °C	0.26 °C	
	(1000 to 1767) °C	0.32 °C	
Type S	(0 to 250) °C	0.38 °C	
	(250 to 1000) °C	0.28 °C	
	(1000 to 1400) °C	0.29 °C	
	(1400 to 1767) °C	0.36 °C	
Type T	(-250 to -150) °C	0.50 °C	
	(-150 to 0) °C	0.19 °C	
	(0 to 120) °C	0.13 °C	
	(120 to 400) °C	0.11 °C	
Type U	(-200 to 0) °C	0.44 °C	
	(0 to 600) °C	0.21 °C	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of RTDs <sup>3</sup> –			
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	0.085 °C 0.12 °C 0.12 °C 0.11 °C 0.097 °C 0.11 °C 0.20 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.064 °C 0.076 °C 0.075 °C 0.089 °C 0.095 °C 0.17 °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	0.21 °C 0.060 °C 0.068 °C 0.070 °C 0.077 °C 0.084 °C 0.090 °C 0.13 °C 0.19 °C	
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.041 °C 0.043 °C 0.044 °C 0.051 °C 0.098 °C 0.11 °C 0.11 °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	0.036 °C 0.043 °C 0.044 °C 0.051 °C 0.066 °C 0.066 °C 0.073 °C 0.088 °C	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Electrical Calibration of RTDs <sup>3</sup> – (cont)			
Pt 385, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.029 °C 0.029 °C 0.036 °C 0.042 °C 0.050 °C 0.18 °C 0.057 °C 0.18 °C	Fluke 5520A
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.081 °C 0.11 °C 0.11 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.69 °C	
Inductance – Generate & Measure <sup>3</sup>	100 μH to 10 H	0.26 mH/H	GenRad 1689M (CMC valid @ 1 kHz only), standard inductors
Capacitance – Measure <sup>3</sup>	(0.1 to 10) pF (10 to 100) pF 100 pF to 25 μF (25 to 100) μF 100 μF to 1 mF	4.8 mF/F 4.8 mF/F 0.23 mF/F 0.24 mF/F 2.6 mF/F	GenRad 1689M (CMC valid @ 1 kHz only)



Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
AC Voltage Flatness – Measure <sup>3</sup>			
(1, 3) V Thermal Converter	10 Hz 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 (>30 to 50) MHz (>50 to 70) MHz (>70 to 80) MHz (>80 to 100) MHz	0.12 % 0.23 % 0.29 % 0.58 % 0.70 % 0.72 % 1.7 % 2.6 % 3.5 % 3.9 % 4.7 %	By comparison to thermal voltage converters w/ HP 3458A opt 002
(0 to 2.2) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.61 mV/V + 0.78 μV 0.97 mV/V + 0.78 μV 1.6 mV/V + 0.78 μV 2.9 mV/V + 0.78 μV 5.8 mV/V + 1.6 μV	Fluke 5790A – wideband output
(2.2 to 7) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.58 mV/V + 0.78 μV 0.71 mV/V + 0.78 μV 1.1 mV/V + 0.78 μV 2.2 mV/V + 0.78 μV 3.4 mV/V + 0.78 μV	
(7 to 22) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.58 mV/V 0.71 mV/V 1.1 mV/V 2.2 mV/V 3.4 mV/V	
(22 to 70) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.45 mV/V 0.6 mV/V 1.1 mV/V 2.1 mV/V 3.3 mV/V	
(70 to 220) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.43 mV/V 0.6 mV/V 1.1 mV/V 2.1 mV/V 3.3 mV/V	

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
AC Voltage Flatness – Measure <sup>3</sup> (cont)			
(220 to 700) mV	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.43 mV/V 0.6 mV/V 1.1 mV/V 2.1 mV/V 3.2 mV/V	Fluke 5790A – wideband output
(0.7 to 2.2) V	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.43 mV/V 0.59 mV/V 1.1 mV/V 2.1 mV/V 3.2 mV/V	
(2.2 to 7) V	(0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.43 mV/V 0.59 mV/V 1.1 mV/V 1.2 mV/V 2.7 mV/V	
Capacitance – Generate <sup>3</sup>			
(220 to 399.9) pF	10 Hz to 10 kHz	5.2 mF/F + 7.8 pF	Fluke 5520A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	4.2 mF/F + 7.8 pF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	4.1 mF/F + 7.8 pF	
(3.3 to 10.9999) nF	(0.01 to 1) kHz	2.4 mF/F + 7.8 pF	
(11 to 32.9999) nF	(0.01 to 1) kHz	2.3 mF/F + 78 pF	
(33 to 109.999) nF	(0.01 to 1) kHz	2.4 mF/F + 78 pF	
(110 to 329.999) nF	(0.01 to 1) kHz	2.3 mF/F + 0.23 nF	
(0.33 to 1.099 99) μF	(10 to 600) Hz	2.4 mF/F + 0.78 nF	
(1.1 to 3.299 99) μF	(10 to 300) Hz	2.3 mF/F + 2.3 nF	
(3.3 to 10.9999) μF	(10 to 150) Hz	2.4 mF/F + 7.8 nF	
(11 to 32.9999) μF	(10 to 120) Hz	3.4 mF/F + 23 nF	
(33 to 109.999) μF	(10 to 80) Hz	3.8 mF/F + 78 nF	
(110 to 329.999) μF	(0 to 50) Hz	3.5 mF/F + 0.23 μF	
(0.33 to 1.099 99) mF	(0 to 20) Hz	3.5 mF/F + 0.78 μF	
(1.1 to 3.299 99) mF	(0 to 6) Hz	3.5 mF/F + 2.3 μF	
(3.3 to 10.9999) mF	(0 to 2) Hz	3.5 mF/F + 7.8 μF	
(11 to 32.9999) mF	(0 to 0.6) Hz	5.8 mF/F + 23 μF	
(33 to 110) mF	(0 to 0.2) Hz	8.5 mF/F + 78 μF	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
RF Power – Generate <sup>3</sup> @ 50 Ω			
(13.52 to 24) dBm	DC to 20 MHz	0.37 dB	HP 3325A/B
(-56 to 13.51) dBm	DC to 20 MHz	0.42 dB	
(-60 to 13) dBm	10 MHz to 40 GHz	2.2 dB	HP 83640A
(-120 to -60) dBm	10 MHz to 40 GHz	2.6 dB	
RF Power – Measure <sup>3</sup> @ 50 Ω			
(-30 to 20) dBm	(10 to 50) MHz	2.8 %	HP 8902A: w/ 8481A
	(0.05 to 2) GHz	1.9 %	
	(2 to 8) GHz	2.1 %	
	(8 to 12) GHz	2.2 %	
	(12 to 18) GHz	2.5 %	
(-70 to -20) dBm	50 MHz to 12 GHz	2.9 %	w/ 8485A
	(12 to 18) GHz	3.6 %	
	(18 to 26.5) GHz	5.1 %	
(-30 to +20) dBm	(10 to 30) MHz	2.8 %	w/ 8484A
	30 MHz to 4 GHz	2.1 %	
	(4 to 12) GHz	2.2 %	
	(12 to 18) GHz	2.5 %	
(-30 to +20) dBm	(100 to 500) kHz	3.5 %	w/ 8482A
	500 kHz to 2 MHz	2.0 %	
	(2 to 100) MHz	1.8 %	
	(0.1 to 2) GHz	1.9 %	
	(2 to 4.2) GHz	2.4 %	

Parameter/Range	Frequency	CMC <sup>2,4,5</sup> (±)	Comments
RF Power Reference <sup>3</sup> @ 50 MHz	1 mW	0.86 %	HP 478-H75, HP 432A, 3458A
Phase Modulation – Measure <sup>3</sup>	Rate: 200 Hz to 10 kHz Frequency: 150 kHz to 10 MHz	3.5 % + 1 LSD	HP 8902A w/ 11722A or 11793A
	Rate: 200 Hz to 20 kHz Frequency: 10 MHz to 26.5 GHz	3.5 % + 1 LSD	
Amplitude Modulation – Measure <sup>3</sup> , Depth to 99 %	Rate: 50 Hz to 10 kHz Frequency: 150 kHz to 10 MHz	2.3 % + 1 LSD	HP 8902A
	Rate: 20 Hz to 10 kHz Frequency: 150 kHz to 10 MHz	3.5 % + 1 LSD	
	Rate: 50 Hz to 50 kHz Frequency: 10 MHz to 1.3 GHz	1.2 % + 1 LSD	
	Rate: 20 Hz to 100 kHz Frequency: 10 MHz to 1.3 GHz	3.5 % + 1 LSD	
	Rate: 50 Hz to 50 kHz Frequency: (1.3 to 26.5) GHz	1.8 % + 1 LSD	
	Rate: 20 Hz to 100 kHz Frequency: (1.3 to 26.5) GHz	3.5 % + 1 LSD	
Frequency Modulation – Measure <sup>3</sup>	Rate: 20 Hz to 10 kHz Frequency: 250 kHz to 10 MHz Deviations: ≤40 kHz Peak	2.3 % + 1 LSD	HP 8902A
	Rate: 50 Hz to 100 kHz Frequency: 10 MHz to 1.3 GHz Deviations: ≤400 kHz Peak	1.2 % + 1 LSD	
	Rate: 20 Hz to 200 kHz Frequency: 10 MHz to 1.3 GHz Deviations: ≤400 kHz Peak	5.8 % + 1 LSD	
	Rate: 50 Hz to 100 kHz Frequency: (1.3 to 26.5) GHz Deviations: ≤400 kHz Peak	1.2 % + 1 LSD	
	Rate: 20 Hz to 200 kHz Frequency: (1.3 to 26.5) GHz Deviations: ≤400 kHz Peak	5.8 % + 1 LSD	

Parameter/Range	Frequency	CMC <sup>2,4</sup> ( $\pm$ )	Comments
Attenuation Measure <sup>3</sup> – (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 (120 to 127) dB  (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 85) dB	Up to 2.4 GHz                (2.4 to 26.5) GHz	0.063 dB 0.07 dB 0.089 dB 0.096 dB 0.15 dB 0.14 dB 0.15 dB 0.15 dB 0.17 dB 0.18 dB 0.19 dB 0.21 dB 0.23 dB  0.063 dB 0.07 dB 0.089 dB 0.096 dB 0.15 dB 0.14 dB 0.15 dB 0.15 dB 0.17 dB	HP 8902A w/ 11793A, 11722A, & 11792A

IV. Mechanical

Parameter/Equipment	Range	CMC <sup>2, 5, 6, 8</sup> ( $\pm$ )	Comments
Pressure – Measure & Measuring Equipment <sup>3</sup>  Pneumatic  Hydraulic	  (-14 to 125) psig (125 to 2500) psig  (2500 to 10 000) psig	  0.0053 psi 0.0096 %  0.015 %	  Ruska 7250 XI  Mensor 2101
Durometers <sup>3</sup> – Spring Force  Type A, B, O Type C, D, DO	  (20 to 90) Duro (20 to 90) Duro	  (0.76 + 0.000 43D) Duro (0.57 + 0.000 57D) Duro	  RDC-1, gage blocks

Parameter/Equipment	Range	CMC <sup>2,5,8</sup> (±)	Comments
Torque Wrenches <sup>3</sup>	(5 to 50 lbf·in (25 to 250 lbf·in (100 to 1000) lbf·in (20 to 250) lbf·ft  (60 to 600) lbf·in (200 to 2000) lbf·ft (2000 to 4000) lbf·ft	0.30 % 0.31 % 0.46 % 0.43 %  0.65 % 0.38 % + 1 LSD 0.31 % + 1 LSD	CDI 2000-400-02    CDI 2000-12-02 AKO TSD 404 AKO TSD 4011
Indirect Verification Hardness Testers – Rockwell <sup>3</sup>	HRA (20 to 69) HRA (70 to 79) HRA (80 to 86) HRA  HRBW (0 to 59) HRBW (60 to 79) HRBW (80 to 100) HRBW  HRC: (20 to 39) HRC (40 to 59) HRC (60 to 70) HRC  HREW: (57 to 83) HREW (84 to 92) HREW (93 to 100) HREW  HR45N: (19 to 36) HR45N  HR15TW: (87 to 93) HR15TW	1.2 HRA 1.2 HRA 0.62 HRA  1.9 HRBW 1.4 HRBW 1.3 HRBW  1.2 HRC 1.2 HRC 0.69 HRC  1.3 HREW 1.3 HREW 1.3 HREW  1.3 HR45N  1.2 HR15TW	Hardness blocks

#### V. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2,8</sup> (±)	Comments
Temperature – Measuring Equipment <sup>3</sup>	(-45 to 0) °C (0 to 110) °C (110 to 420) °C (420 to 550) °C (550 to 661) °C	0.019 °C 0.025 °C 0.024 °C 0.085 °C 0.41 °C	Liquid baths, dry wells & 1590 super thermometer w/ 5628 PRT
Temperature – Measure <sup>3</sup>	(-200 to 0) °C (0 to 420) °C (420 to 661) °C	0.015 °C 0.020 °C 0.066 °C	1590 super thermometer w/ 5628 PRT

## VI. Time & Frequency

Parameter/Equipment	Range	CMC <sup>2, 5, 8</sup> ( $\pm$ )	Comments
Frequency – Generate <sup>3</sup>	10 MHz	5.8 mHz + 0.6 <i>R</i>	GPS
	(0.001 to 1000) Hz (0.001 to 20) MHz	0.12 mHz/Hz 0.6 nHz/Hz	GPS w/ HP 3325B
	10 MHz to 40 GHz	0.58 nHz/Hz	GPS w/ HP 83640A
Frequency – Measure <sup>3</sup>	0.001 Hz to 1 kHz (1 to 1000) kHz (1 to 225) MHz 225 MHz to 3 GHz	0.12 mHz/Hz 0.12 $\mu$ Hz/Hz 0.12 $\mu$ Hz/Hz 0.12 $\mu$ Hz/Hz	GPS w/ HP 53132A opt 3
	(100 to 500) MHz (0.5 to 40) GHz	0.10 $\mu$ Hz/Hz 0.12 $\mu$ Hz/Hz	GPS w/ 5352B
Tachometers <sup>3</sup> –  Optical	(10 to 100 000) RPM	0.0023 RPM	GPS w/ HP 3325B
Stopwatches & Timers <sup>3</sup>	Up to 19.99 s/day	0.061 s/day	Timometer

<sup>1</sup> This laboratory offers commercial and field calibrations.

<sup>2</sup> 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. CMC's represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of  $k = 2$ . The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

<sup>3</sup> Field calibration service is available for this calibration. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

<sup>4</sup> 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 percent or fraction of the reading plus a fixed floor specification.

<sup>5</sup> In the statement of CMC,  $L$  is the numerical value of the nominal length of the device measured in inches;  $R$  is the resolution of the unit under test; Percent not identified in the CMC statement are % of reading; LSD stands for least significant digit;  $\angle$  is the angle.

<sup>6</sup> In the statement of durometer hardness, *D* is numerical value of hardness in Duro units.

<sup>7</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.

<sup>8</sup> 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

**TEKTRONIX, INC.**

Everett, WA

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 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 3<sup>rd</sup> day of June 2024.

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 2357.07  
Valid to June 30, 2026

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