



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

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CALIBRATION

Valid To: June 30, 2023

Certificate Number: 2357.06

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations<sup>1,6</sup>:

I. Dimensional

Parameter/Equipment	Range	CMC <sup>2,5,7</sup> (±)	Comments
Calipers <sup>3</sup>	Up to 4 in (4 to 12) in (12 to 48) in	(58 + 0.76L) μin (56 + 3.1L) μin (31 + 5.2L) μin	Gage block set
Micrometers <sup>3</sup> –  Flatness <sup>3</sup> Parallelism <sup>3</sup>	Up to 4 in (4 to 12) in (12 to 48) in  Up to 1 in Up to 1 in	(7.9 + 2.8L) μin (22 + 4.7L) μin (12 + 5.6L) μin  6.1 μin 6.6 μin	Gage block set  Optical flat Optical parallel
Indicators <sup>3</sup>	Up to 1.0 in  (0.05 to 4) in (4 to 6) in	84 μin  (29 + 1.5L) μin (35 + 0.5L) μin	Starrett 716  UMM and gage block set
Gage Blocks	(0.01 to 1) in (1 to 4) in	(7.1 + 2.2L) μin (7.1 + 2.2L) μin	P&W Labmaster™
Height Gages <sup>3</sup>	(0.05 to 4) in (4 to 12) in (12 to 48) in	(78 + 0.51L) μin (76 + 1.1L) μin (55 + 2.8L) μin	Gage block set

Parameter/Equipment	Range	CMC <sup>2, 5, 7</sup> ( $\pm$ )	Comments
Optical Comparators <sup>3</sup>			
Angle	15° 30° 45°	0.015° 0.015° 0.015°	Angle blocks and gage blocks
XY Linearity	Up to 4 in (> 4 to 12) in	78 $\mu$ in 87 $\mu$ in	
Depth Gages <sup>3</sup>	(0.05 to 4) in (4 to 12) in (12 to 48) in	(30 + 0.25L) $\mu$ in (31 + 1.4L) $\mu$ in (42 + 4.1L) $\mu$ in	Gage block set
Feeler and Thickness Gage	0.005 in (0.05 to 5) in	35 $\mu$ in (48 + 14L) $\mu$ in	P&W model C and gage block set
Cylindrical Pins and Plugs	Up to 4 in	(7.2 + 3.3L) $\mu$ in	Labmaster™ and gage blocks
Laser Micrometer <sup>3</sup>	Up to 1 in	12 $\mu$ in	Master pin

## II. Dimensional Testing/Calibration<sup>1</sup>

Parameter/Equipment	Range	CMC <sup>2, 5</sup> ( $\pm$ )	Comments
Length – 1D <sup>8</sup>	(0.05 to 10) in	(11 + 1.3L) $\mu$ in	P&W model C and gage block set

## III. Electrical – DC / Low Frequency

Parameter/Equipment	Range	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
DC Voltage – Generate <sup>3</sup>	(0 to 219.999 99) mV (0.22 to 2.199 999 9) V (2.2 to 10.999 999) V (11 to 21.999 999) V	8.3 $\mu$ V/V + 0.62 $\mu$ V 6.2 $\mu$ V/V + 0.93 $\mu$ V 6.2 $\mu$ V/V + 3.1 $\mu$ V 6.2 $\mu$ V/V + 6.2 $\mu$ V	Fluke 5700A w/ 5725 amplifier

Parameter/Equipment	Range	CMC <sup>2, 4</sup> (±)	Comments
DC Voltage – Generate <sup>3</sup> (cont)	(22 to 219.999 99) V (220 to 1100) V	7.0 $\mu\text{V/V} + 78 \mu\text{V}$ 8.5 $\mu\text{V/V} + 470 \mu\text{V}$	Fluke 5700A w/ 5725 amplifier
DC Voltage – Measure <sup>3</sup>	(0 to 100) mV 1 V 10 V 100 V 1000 V  (1 to 120) kV	10 $\mu\text{V/V} + 0.23 \mu\text{V}$ 7.8 $\mu\text{V/V} + 2.3 \mu\text{V}$ 7.8 $\mu\text{V/V} + 23 \mu\text{V}$ 9.3 $\mu\text{V/V} + 0.23 \text{mV}$ 9.3 $\mu\text{V/V} + 2.3 \text{mV}$  2.1 mV/V	HP 3458A     High voltage divider & DMM
DC Current – Generate <sup>3</sup>	(0 to 219.9999) $\mu\text{A}$ (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 (0 to 11) A  (11 to 20.5) A	51 $\mu\text{A/A} + 5.4 \text{nA}$ 42 $\mu\text{A/A} + 6.2 \text{nA}$ 42 $\mu\text{A/A} + 39 \text{nA}$ 48 $\mu\text{A/A} + 0.62 \mu\text{A}$ 76 $\mu\text{A/A} + 12 \mu\text{A}$ 0.28 mA/A + 0.37 mA  0.78 mA/A + 0.58 mA	Fluke 5720A w/ 5725 amplifier      Fluke 5520A
Clamp-On Only	(16.5 to 149.999) A (150 to 1025) A	4.4 mA/A + 0.11 mA 5.1 mA/A + 0.39 mA	Fluke 5520A w/ coil
DC Current – Measure <sup>3</sup>	(0 to 100) nA (0 to 1) $\mu\text{A}$ (0 to 10) $\mu\text{A}$ (0 to 100) $\mu\text{A}$ (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A  (1 to 20) A (20 to 100) A	65 $\mu\text{A/A} + 31 \text{pA}$ 32 $\mu\text{A/A} + 31 \text{pA}$ 16 $\mu\text{A/A} + 78 \text{pA}$ 16 $\mu\text{A/A} + 0.62 \text{nA}$ 16 $\mu\text{A/A} + 3.9 \text{nA}$ 17 $\mu\text{A/A} + 39 \text{nA}$ 28 $\mu\text{A/A} + 390 \text{nA}$ 87 $\mu\text{A/A} + 7.8 \mu\text{A}$  56 $\mu\text{A/A}$ 0.46 mA/A	Agilent 3458        Guildline 9711A and 3458A
DC Power – Generate <sup>3</sup>	0.01 mW to 337 W (0.01 to 3060) W (3.06 to 20.91) kW	0.24 mW/W 0.17 mW/W 0.56 mW/W	Fluke 5520A

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments	
DC Resistance – Generate <sup>3</sup>	(0 to 11) Ω	38 μΩ/Ω + 0.78 mΩ	Fluke 5520A	
	(11 to 33) Ω	23 μΩ/Ω + 1.2 mΩ		
	(33 to 110) Ω	22 μΩ/Ω + 1.1 mΩ		
	(110 to 330) Ω	22 μΩ/Ω + 1.6 mΩ		
	(0.33 to 1.1) kΩ	22 μΩ/Ω + 1.6 mΩ		
	(1.1 to 3.3) kΩ	22 μΩ/Ω + 16 mΩ		
	(3.3 to 11) kΩ	22 μΩ/Ω + 16 mΩ		
	(11 to 33) kΩ	24 μΩ/Ω + 0.16 Ω		
	(33 to 110) kΩ	23 μΩ/Ω + 0.16 Ω		
	(110 to 330) kΩ	27 μΩ/Ω + 1.6 Ω		
	(0.33 to 1.1) MΩ	27 μΩ/Ω + 1.6 Ω		
	(1.1 to 3.3) MΩ	59 μΩ/Ω + 23 Ω		
	(3.3 to 11) MΩ	0.10 mΩ/Ω + 39 Ω		
	(11 to 33) MΩ	0.21 mΩ/Ω + 1.9 kΩ		
	(33 to 110) MΩ	0.40 mΩ/Ω + 2.3 kΩ		
	(110 to 330) MΩ	2.4 mΩ/Ω + 78 kΩ		
	(330 to 1100) MΩ	12 mΩ/Ω + 0.39 MΩ		
Fixed Points	1 Ω	0.13 mΩ	Fluke 5700A	
	1.9 Ω	0.18 mΩ		
	10 Ω	0.27 mΩ		
	19 Ω	0.48 mΩ		
	100 Ω	1.7 mΩ		
	190 Ω	3.1 mΩ		
	1 kΩ	12 mΩ		
	1.9 kΩ	23 mΩ		
	10 kΩ	0.11 Ω		
	19 kΩ	0.21 Ω		
	100 kΩ	1.3 Ω		
	190 kΩ	3.0 Ω		
	1 MΩ	50 Ω		
	1.9 MΩ	62 Ω		
	10 MΩ	0.37 kΩ		
	19 MΩ	0.84 kΩ		
	100 MΩ	12 kΩ		
	0.33 mΩ	0.44 μΩ	Guildline 9711A	
	1.0 mΩ	2.5 μΩ		
	10 mΩ	1.7 μΩ		
	100 mΩ	23 μΩ		
	(10 to 100) MΩ	0.13 %		IET HRRS-B-3-10M high resistance decade
	(100 to 1000) MΩ	0.24 %		
	(1 to 10) GΩ	0.58 %		
(10 to 100) GΩ	1.2 %			

Parameter/Equipment	Range	CMC <sup>2, 4</sup> (±)	Comments
DC Resistance – Measure <sup>3</sup>	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (100 to 1200) MΩ	14 μΩ/Ω + 39 μΩ 14 μΩ/Ω + 0.39 mΩ 12 μΩ/Ω + 0.39 mΩ 11 μΩ/Ω + 3.9 mΩ 12 μΩ/Ω + 39 mΩ 17 μΩ/Ω + 1.6 Ω 43 μΩ/Ω + 78 Ω 0.40 mΩ/Ω + 0.78 kΩ 4.8 mΩ/Ω + 7.8 kΩ	Fluke 3458A
AC Voltage – Generate <sup>3</sup>			
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	1.2 mV/V + 5 μV 0.86 mV/V + 5 μV 0.88 mV/V + 5 μV 1.4 mV/V + 5 μV 2.1 mV/V + 6 μV 3.5 mV/V + 12 μV 4.9 mV/V + 25 μV 7.1 mV/V + 25 μV	Fluke 5700A w/ 5725A
(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	0.51 mV/V + 5 μV 0.25 mV/V + 5 μV 0.17 mV/V + 5 μV 0.4 mV/V + 5 μV 0.82 mV/V + 6 μV 1.3 mV/V + 12 μV 1.7 mV/V + 25 μV 4.1 mV/V + 25 μV	Fluke 5700A w/ 5725A
(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 + 15 μV 190 μV/V + 8 μV 93 μV/V + 8 μV 0.29 mV/V + 8 μV 0.71 mV/V + 20 μV 0.88 mV/V + 25 μV 1.4 mV/V + 31 μV 2.9 mV/V + 78 μV	
(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 (0.5 to 1) MHz	0.63 mV/V + 78 μV 140 μV/V + 23 μV 69 μV/V + 5.4 μV 120 μV/V + 16 μV 0.24 mV/V + 62 μV 0.42 mV/V + 120 μV 0.96 mV/V + 250 μV 2.0 mV/V + 0.78 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	0.55 mV/V + 0.78 mV 0.14 mV/V + 0.23 mV 70 μV/V + 70 μV 120 μV/V + 160 μV 0.23 mV/V + 0.31 mV 0.49 mV/V + 1.3 mV 1.1 mV/V + 3.9 mV 2.5 mV/V + 7.0 mV	Fluke 5700A w/ 5725A
(22 to 220) V (Subject to 2.2 x 10 <sup>7</sup> V-Hz limitation)	(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 140 μV/V + 2.3 mV 74 μV/V + 0.78 mV 0.20 mV/V + 3.1 μV 0.47 mV/V + 7.8 mV 1.3 mV/V + 85 mV 4.2 mV/V + 50 μV 11 mV/V + 170 mV	
(220 to 250) V	(15 to 50) Hz	0.28 mV/V + 20 μV	
(220 to 1000) V	(0.05 to 1) kHz (1 to 20) kHz (20 to 30) kHz	77 μV/V + 4 μV 0.13 mV/V + 6 μV 0.49 mV/V + 11 μV	
(220 to 750) V	(0.03 to 50) kHz (50 to 100) kHz	0.49 mV/V + 11 μV 1.8 mV/V + 45 μV	
Leveled Output (Flatness)			
(Up to 1.1) 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 0.98 mV/V 2.2 mV/V + 2.3 μV 3.7 mV/V + 2.3 μV 5.5 mV/V + 2.3 μV 13 mV/V + 12 μV	Fluke 5700A wideband output, referenced to 1 kHz
(1.1 to 3) 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 0.94 mV/V 1.3 mV/V + 2.3 μV 2.2 mV/V + 2.3 μV 4.9 mV/V + 2.3 μV 13 mV/V + 2.3 μV	

Parameter/Range	Frequency	CMC <sup>2, 4</sup> ( $\pm$ )	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
Leveled Output (Flatness)			
(3 to 11) 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 0.94 mV/V 1.1 mV/V + 2.3 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.9 mV/V + 2.3 $\mu$ V 8.6 mV/V + 2.3 $\mu$ V	Fluke 5700A wideband output, referenced to 1 kHz
(11 to 33) 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 0.91 mV/V 1.0 mV/V + 2.3 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.8 mV/V + 2.3 $\mu$ V 8.5 mV/V + 2.3 $\mu$ V	
(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 1.1 mV/V + 2.3 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.8 mV/V + 2.3 $\mu$ V 8.5 mV/V + 2.3 $\mu$ V	
(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 1.1 mV/V + 2.3 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.8 mV/V + 2.3 $\mu$ V 8.5 mV/V + 2.3 $\mu$ V	
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 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.8 mV/V + 2.3 $\mu$ V 8.5 mV/V + 2.3 $\mu$ V	
(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	2.3 mV/V 0.84 mV/V 1.0 mV/V + 2.3 $\mu$ V 2.0 mV/V + 2.3 $\mu$ V 3.8 mV/V + 2.3 $\mu$ V 8.5 mV/V + 2.3 $\mu$ V	

Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments
AC Voltage <sup>3</sup> – Measure			
(0 to 10) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz 100 kHz to 1 MHz	0.27 μV/V + 2.3 μV 0.19 μV/V + 0.85 μV 0.25 μV/V + 0.85 μV 0.78 μV/V + 0.85 μV 3.9 μV/V + 0.85 μV 3.1 μV/V + 3.9 μV	HP 3458A
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.13 μV/V + 3.1 μV 84 μV/V + 1.6 μV 0.11 μV/V + 1.6 μV 0.23 μV/V + 1.6 μV 0.62 μV/V + 1.6 μV 2.5 μV/V + 7.8 μV 7.9 μV/V + 7.8 μV	
(0.1 to 1) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	90 μV/V + 0.31 mV 55 μV/V + 0.16 mV 0.11 mV/V + 0.16 mV 0.23 mV/V + 0.16 mV 0.62 mV/V + 0.16 mV 2.5 mV/V + 0.78 mV 7.9 mV/V + 0.78 mV	
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	90 μV/V + 0.31 mV 55 μV/V + 0.16 mV 0.11 mV/V + 0.16 mV 0.23 mV/V + 0.16 mV 0.62 mV/V + 0.16 μV 2.5 mV/V + 0.78 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.17 mV/V + 3.1 mV 0.16 mV/V + 1.6 mV 0.16 mV/V + 1.6 mV 0.27 mV/V + 1.6 mV 0.93 mV/V + 1.6 mV 3.2 mV/V + 7.8 mV 12 mV/V + 7.8 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.32 mV/V + 31 mV 0.31 mV/V + 16 mV 0.47 mV/V + 16 mV 0.93 mV/V + 16 mV 2.3 mV/V + 16 mV	
700 V to 85 kV	60 Hz	5.9 mV	High Voltage divider w/ DMM



Parameter/Range	Frequency	CMC <sup>2,4</sup> (±)	Comments	
AC Current – Generate <sup>3</sup>				
(9 to 220) µA	(10 to 20) Hz (20 to 40) Hz (0.040 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.7 mA/A + 25 nA 0.33 mA/A + 20 nA 0.13 mA/A + 16 nA 0.54 mA/A + 40 nA 1.4 mA/A + 80 nA	Fluke 5700A w/ 5725A	
(0.22 to 2.2) mA	(10 to 20) Hz (20 to 40) Hz (0.040 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.67 mA/A + 40 nA 0.34 mA/A + 35 nA 0.16 mA/A + 35 nA 0.55 mA/A + 0.40 µA 1.4 mA/A + 0.80 µA		
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz (0.040 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.67 mA/A + 0.40 µA 0.33 mA/A + 0.35 µA 0.12 mA/A + 0.35 µA 0.54 mA/A + 4.0 µA 1.4 mA/A + 8.0 µA		
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz (0.040 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.67 mA/A + 4.0 µA 0.33 mA/A + 3.5 µA 0.14 mA/A + 3.5 µA 0.54 mA/A + 40 µA 1.4 mA/A + 80 µA		
(0.22 to 2.2) A	(0.020 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.58 mA/A + 35 µA 0.66 mA/A + 80 µA 7.75 mA/A + 0.16 mA		
(2.2 to 11) A	(0.020 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.41 mA/A + 0.17 mA 0.76 mA/A + 0.38 mA 2.8 mA/A + 0.75 mA		
(11 to 20.5) A	(45 to 100) Hz (0.1 to 1) kHz (1 to 5) kHz	0.94 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA		
(10 to 100) A	1 kHz	0.13 %		
Toroidal Type Clamps				
(16.5 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.39 % 0.84 %		Fluke 5520A w/ coil

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
AC Current – Generate <sup>3</sup> (cont)			
Toroidal Type Clamps			
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.38 % 0.84 %	Fluke 5520A w/ coil
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 <sup>3</sup>			
Up to 100 µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	3.1 mA/A + 23 nA 1.2 mA/A + 23 nA 0.52 mA/A + 23 nA	HP 3458A
(0.1 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.10 to 5) kHz	3.14 mA/A + 0.16 µA 1.2 mA/A + 0.16 µA 0.5 mA/A + 0.16 µA 0.25 mA/A + 0.16 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.10 to 5) kHz	3.1 mA/A + 1.6 µA 1.2 mA/A + 1.6 µA 0.47 mA/A + 1.6 µA 0.25 mA/A + 1.6 µA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.10 to 5) kHz	3.1 mA/A + 16 µA 1.2 mA/A + 16 µA 0.47 mA/A + 16 µA 0.25 mA/A + 16 µA	
(0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz (0.10 to 5) kHz	3.1 mA/A + 0.16 mA 1.2 mA/A + 0.16 mA 0.64 mA/A + 0.16 mA 0.80 mA/A + 0.16 mA	

Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
AC Current – Measure <sup>3</sup>  (10 to 100) A	1 kHz	0.13 %	2575A shunt and DMM
AC Power – Generate <sup>3</sup>  (0.109 to 3) mW (0.297 to 10.89) W (1.09 to 29.7) mW (3 to 109) mW (10.9 to 297) mW (29.7 to 726) mW 72.6 mW to 1.5 W 150 mW to 6.8 W 1.1 mW to 9.2 W 3.0 mW to 33.6 W 11 mW to 92 W 30 mW to 337 W 110 mW to 918 W (0.3 to 2244) W 73 mW to 4.6 kW 1.5 W to 20.9 kW	(45 to 65) Hz, PF = 1	2.3 mW/W 1.4 mW/W 1.1 mW/W 1.3 mW/W 1.0 mW/W 1.0 mW/W 1.1 mW/W 1.0 mW/W 3.4 mW/W 0.65 mW/W 0.94 mW/W 0.62 mW/W 0.86 mW/W 0.71 mW/W 0.96 mW/W 0.81 mW/W	Fluke 5520A
Capacitance – Generate <sup>3</sup>  (0.19 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF (0.33 to 1.1) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF (0.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz Up to 80 Hz Up to 50 Hz Up to 20 Hz Up to 2 Hz Up to 0.6 Hz Up to 0.2 Hz	4.1 mF/F + 7.8 pF 4.0 mF/F + 7.8 pF 2.3 mF/F + 7.8 pF 2.3 mF/F + 78 pF 2.3 mF/F + 0.23 nF 2.3 mF/F + 0.78 nF 2.3 mF/F + 2.3 nF 2.3 mF/F + 7.8 nF 3.4 mF/F + 23 nF 3.7 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 8.5 mF/F + 78 μF	Fluke 5520A



Parameter/Range	Frequency	CMC <sup>2, 4</sup> (±)	Comments
Capacitance – Generate <sup>3</sup> (cont)			
100 pF	Single Capacitor	0.23 % + 0.32 μF	Arco SS-32 capacitor set
200 pF		0.18 % + 1.3 μF	
300 pF		0.17 % + 3.2 μF	
400 pF		0.16 % + 4.0 μF	
500 pF to 2 nF		0.15 % + 7.2 μF	
3 nF to 0.5 μF		0.14 % + 15 μF	
Up to 1.4 μF	Up to 4 combined	0.74 % + 15 μF	
Inductance – Generate <sup>3</sup>			
1 mH	Up to 1 kHz	1.2 μH	General Radio 1482 series inductors
100 mH	Up to 1 kHz	0.12 μH	
500 mH	Up to 1 kHz	0.34 mH	
1 H	Up to 1 kHz	1.2 mH	

Parameter/Equipment	Range	CMC <sup>2, 4</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators and Simulators <sup>3</sup> –			
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	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators and Simulators <sup>3</sup> – (cont)			
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	Fluke 5520A
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.45 °C 0.28 °C 0.26 °C 0.32 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.38 °C 0.28 °C 0.29 °C 0.36 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.50 °C 0.19 °C 0.13 °C 0.11 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.21 °C	
Electrical Calibration of RTD Indicators <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	

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Electrical Calibration of RTD Indicators <sup>3</sup> – (cont)			
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	Fluke 5520A
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	
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	
PtNi 385, 120 Ω (Ni120)	(-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	

Parameter/Equipment	Range	CMC <sup>2, 4, 5</sup> ( $\pm$ )	Comments
Oscilloscope <sup>3</sup> – DC Voltage – 50 $\Omega$ 1 M $\Omega$	(0 to 6.6) V (0 to 130) V	1.9 mV/V + 24 $\mu$ V 0.27 mV/V + 24 $\mu$ V	Fluke 5520A/SC1100
Squarewave – 10 Hz to 10 kHz 50 $\Omega$ 1 M $\Omega$	1 mV to 6.6 V <sub>p-p</sub> 1 mV to 130 V <sub>p-p</sub>	1.9 mV/V + 24 $\mu$ V 0.78 mV/V + 24 $\mu$ V	Fluke 5520A / SC1100
Sinewave Flatness – Generate, 50 kHz to 10 MHz Reference, V <sub>p-p</sub>	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (0.6 to 1.1) GHz (1.1 to 18) GHz	3.0 % + 78 $\mu$ V 3.4 % + 78 $\mu$ V 4.3 % + 78 $\mu$ V 4.9 % + 78 $\mu$ V 3.0 %	Signal Generator, Power splitter, 8481A/D sensor
Resistance – Measure	(40 to 90) $\Omega$ (0.6 to 1.5) M $\Omega$	0.79 m $\Omega$ / $\Omega$ 0.79 m $\Omega$ / $\Omega$	Fluke 5520A / SC1100
Rise Time – Generate	(200 to 300) ps 1 kHz to 2 MHz	19 ps	
	(200 to 350) ps 2 MHz to 10 MHz	19 ps	
Time Marker – Generate	1 ns to 20 ms 50 ms to 5 s Non-cardinal point	6.2 $\mu$ s/s 7.8 ms/s + 0.0019 % 39 $\mu$ s/s	

#### IV. Electrical – RF/Microwave

Parameter/Equipment	Range	CMC <sup>2, 5</sup> ( $\pm$ )	Comments
RF Power – Measure <sup>3</sup> (-30 to 20) dBm	(100 to 500) kHz (0.5 to 1) MHz (0.001 to 2) GHz (2 to 4.2) GHz	1.7 % 1.7 % 1.5 % 1.9 %	Power meter w/ 8482A, HP 8496B Step Attenuator

Parameter/Range	Frequency	CMC <sup>2, 5</sup> (±)	Comments
Flatness – Measure <sup>3</sup>			
	0.5 V Thermal Converter		EL-2255
	10 Hz	0.12 %	
	100 Hz	0.12 %	
	1 kHz	0.12 %	
	10 kHz	0.12 %	
	30 kHz	0.23 %	
	100 kHz	0.29 %	
	300 kHz	0.29 %	
	1 MHz	0.58 %	
	3 MHz	0.70 %	
	8 MHz	0.70 %	
	0.5 V Thermal Converter		EL-2257
	10 MHz	0.70 %	
	20 MHz	0.71 %	
	30 MHz	1.7 %	
	50 MHz	2.6 %	
	70 MHz	3.4 %	
	80 MHz	3.8 %	
	100 MHz	4.7 %	
	3 V Thermal Converter		
	10 Hz	0.12 %	
	100 Hz	0.12 %	
	1 kHz	0.12 %	
	10 kHz	0.12 %	
	30 kHz	0.23 %	
	100 kHz	0.29 %	
	300 kHz	0.29 %	
	1 MHz	0.58 %	
	3 MHz	0.70 %	
	8 MHz	0.70 %	
	10 MHz	0.70 %	
	20 MHz	0.72 %	
	30 MHz	1.7 %	
	50 MHz	2.6 %	
	70 MHz	3.4 %	
	80 MHz	3.8 %	
	100 MHz	4.7 %	



V. Mechanical

Parameter/Equipment	Range	CMC <sup>2, 5, 7</sup> (±)	Comments
Scales & Balances <sup>3</sup>	(1 to 500) mg (0.5 to 3) g (3 to 10) g (10 to 50) g (50 to 100) g (100 to 300) g (300 to 500) g (0.5 to 1) kg (1 to 2) kg	12 µg 48 µg 61 µg 0.15 mg 0.30 mg 0.63 mg 1.4 mg 2.9 mg 5.9 mg	Class 1 weights
	(0.25 to 0.5) lb (0.5 to 10) lb (20 to 25) lb (25 to 50) lb (50 to 100) lb (100 to 250) lb (250 to 500) lb	0.000019 lb 0.0019 lb 0.0037 lb 0.0059 lb 0.0088 lb 0.014 lb 0.019 lb	Class F weights
Torque Wrenches <sup>3</sup>	(5 to 50) ozf·in (15 to 200) ozf·in	0.60 % 0.32 %	Transducers: CDI 2000-4-02 CDI 2000-5-02
	(5 to 50) lbf·in (40 to 400) lbf·in (100 to 1000) lbf·in (20 to 250) lbf·ft	0.30 % 0.31 % 0.46 % 0.43 %	CDI 2000-400-02 (4 in 1) transducer
Pressure – Measuring Equipment	Up to 0.5 psig Up to 1.0 psig	0.00017 psig 0.00012 psig	Mensor CPC 6000 0.5/1.0 PSIG
	(0 to 7.5) psia (0 to 15) psia	0.0009 psia 0.0018 psia	7.5/15 PSIA
	(0 to 150) psia (0 to 300) psia	0.018 psia 0.035 psia	150/300 PSIA
	(0 to 750) psig (0 to 1500) psig	0.088 psig 0.18 psig	750/1500 PSIA
Pressure – Measuring Equipment <sup>3</sup>	(0 to 2000) psi (0 to 3000) psi	0.51 PSI 1.7 PSI	RPM1-A2000 700G29

Parameter/Equipment	Range	CMC <sup>2,7</sup> (±)	Comments
Force – Measuring Equipment <sup>3</sup> –			
Tension	(0 to 1) lbf (1 to 10) lbf (10 to 20) lbf	0.0006 lbf 0.003 lbf 0.018 lbf	Class F weights
Compression	(0 to 300) lbf	0.070 lbf	Load cells

#### VI. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2,5,7</sup> (±)	Comments
Temperature – Measure <sup>3</sup>	(-78 to 300) °C	0.062 °C	Fluke 1552A
Temperature – Measure <sup>3</sup>	(30 to 100) °C	1.7 °C	Agilent 34970A w/ T type thermocouples
Infrared Temperature – Measuring Equipment <sup>3</sup>	(-15 to 0) °C (0 to 100) °C (100 to 120) °C  (35 to 100) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.55 °C 0.63 °C 0.72 °C  0.63 °C 0.92 °C 1.5 °C 2.1 °C	Fluke 4180  Fluke 4181
Relative Humidity – Measure <sup>3</sup>	(20 to 80) % RH	1.3 %	Vaisala HMI 141 w/ HP46 probe

#### VII. Time & Frequency

Parameter/Equipment	Frequency	CMC <sup>2,7</sup> (±)	Comments
Time Interval	(0.1 to 200) s	(18 + 4.7 x interval) ns	Agilent 53132A

Parameter/Equipment	Frequency	CMC <sup>2, 7</sup> ( $\pm$ )	Comments
Timers and Stopwatches – Measuring Equipment <sup>3</sup>	(0 to 19.99) s/day	0.038 s/day	Helmut Klein Timometer
	(1 to 86400) sec	0.039 s/day	Agilent 53132A
Frequency – Measure <sup>3</sup>	0.001 Hz to 1 kHz (1 to 1000) kHz (1 to 225) MHz (0.1 to 3) GHz	0.22 mHz/Hz 1.8 $\mu$ Hz/Hz 0.18 uHz/Hz 0.18 uHz/Hz	Agilent 53132A
Frequency – Measuring Equipment <sup>3</sup>	1 mHz to 1000 Hz 1000 Hz to 50 MHz	0.66 $\mu$ Hz/Hz 2.3 $\mu$ Hz/Hz	Agilent 3325B
Optical Tachometers – Measuring Equipment <sup>3</sup>	(10 to 100 000) RPM	0.016 RPM + 0.6R	Agilent 33250A

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

<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. 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.

<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. CMC's are expressed as either a specific value that covers the full range or as a percent or fraction of the reading plus a fixed floor specification.

<sup>5</sup> 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, % is percent of reading unless otherwise stated. In the statement of CMC,  $t$  represents the time.

<sup>6</sup> This scope meets A2LA's *P112 Flexible Scope Policy*.

<sup>7</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.

<sup>8</sup> This laboratory meets *R205 – Specific Requirements: Calibration Laboratory Accreditation Program* for the types of dimensional tests listed above and is considered equivalent to that of a calibration.





# Accredited Laboratory

A2LA has accredited

**TEKTRONIX, INC.**

*Somerset, PA*

for technical competence in the field of

**Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NC SL Z540-1-1994 and the requirements of ANSI/NC SL 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 7<sup>th</sup> day of May 2021.

A blue ink signature of a person, likely the Vice President of Accreditation Services, written over a horizontal line.

Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 2357.06  
Valid to June 30, 2023

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