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

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CALIBRATION

Valid to: March 31, 2026 Certificate Number: 1278.01

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[1, 7]:

I. Acoustical

Parameter/Frequency	Range	CMC[2] (±)	Comments
Sound Level Meters – Measure at 1000 Hz	94 dB 114 dB	0.40 dB 0.40 dB	Larson Davis CAL200

II. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Dial Indicators[3]	Up to 1 in	76 µin	Dial indicator calibrator
Micrometers[3] – Inside, Outside	Up to 8 in (6 to 18) in	(22 + 18L) µin (68 + 20L) µin	Gage blocks Step gage
Calipers[3]	Up to 8 in (8 to 18) in	(280 + 6.1L) µin (280 + 9.8L) µin	Gage blocks with surface plate Step gage

Parameter/Equipment	Range	CMC[2] (±)	Comments
Steel Rules 1/16 1/32	 Up to 12 in Up to 12 in	 0.036 in 0.018 in	 Grade 3 gage blocks
Tape Measures	Up to 50 in	0.02 in + 0.000 047 in/in	Steel rule

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
DC Voltage – Measure[3]	Up to 200 mV 200 mV to 2 V (1 to 20) V (20 to 200) V (200 to 1000) V	0.0001 mV + 0.000 005 V/V 0.000 000 41 V + 0.000 003 5 V/V 0.000 004 1 V + 0.000 003 5 V/V 0.000 042 V + 0.000 005 5 V/V 0.000 52 V + 0.000 005 5 V/V	Fluke 8508A
DC High Voltage – Measure[3]	(1 to 30) kV (31 to 120) kV	0.018 % 0.14 %	Ross VD30 Ross VD120
DC Voltage – Generate[3]	(0 to 220) mV 220 mV to 2.2V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	8.9 µV/V + 0.4 µV 5.2 µV/V + 0.7 µV 3.6 µV/V + 2.5 µV 3.6 µV/V + 4 µV 5.6 µV/V + 40 µV 6.6 µV/V + 400 µV	Fluke 5720A
DC Current – Measure[3]	Up to 100 nA 100 nA to 1 µA (1 to 10) µA (10 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A	43 µA/A + 0.04 nA 28 µA/A + 0.04 nA 24 µA/A + 0.1 nA 0.000 41 µA + 0.000 012 A/A 0.000 004 mA + 0.000 012 A/A 0.000 041 mA + 0.000 14 A/A 0.0008 mA + 0.000 048 A/A 0.000 016 A + 0.000 19 A/A	HP 3458A opt 002 Fluke 8508A

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
DC Current – Measure[3] (cont)	(1 to 2) A	59 µA/A	HP 3458A with L&N 4221B current shunt
	(2 to 10) A	75 µA/A	HP 3458A with L&N 4222B
	(10 to 20) A	0.015 %	HP 3458A with Fluke Y5020
	(20 to 100) A	0.077 %	Valhalla 2575A
DC Current – Generate[3]	(0 to 220) µA 220 µA to 2.2 mA (2.2 to 22) mA	41 µV/V + 6 nA 36 µV/V + 7 nA 36 µV/V + 40 nA	Fluke 5720A
	(22 to 220) mA	46 µV/V + 0.7 µA	*Add (200 x I2) µA/A for I > 100 mA
	220 mA to 2.2 A	82 µV/V + 12 nA	**Add (10 x I2) µA/A for I > 1 A
	(2.2 to 10.9999) A	0.039 % + 0.5 mA	Fluke 5500A
	(11 to 20) A (20 to 100) A	0.042 % + 0.03 % of range 0.068 % + 0.03 % of range	Fluke 5522A Valhalla 2555A
Non-Toroidal	(20 to 1000) A	0.58 % + 0.5 A	Fluke 5522A w/ Fluke 5500 coil
Resistance – Measure[3]	Up to 2 Ω (2 to 20) Ω 20 Ω to 2 kΩ	0.000 004 2 Ω + 0.000 017 Ω/Ω 0.000 014 Ω + 0.000 097 Ω/Ω 0.000 000 53 Ω + 0.000 008 2 Ω/Ω	Fluke 8508A
	(2 to 20) kΩ	0.000 005 8 kΩ + 0.000 008 1 Ω/Ω	
	(20 to 200) kΩ	0.000 056 kΩ + 0.000 082 Ω/Ω	
	200 kΩ to 2 MΩ	0.000 001 1 MΩ + 0.000 009 2 Ω/Ω	
	(2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	0.0001 MΩ + 0.000 020 Ω/Ω 0.0095 MΩ + 0.0013 Ω/Ω 0.0001 GΩ + 0.000 18 Ω/ Ω 0.01 GΩ + 0.0015 Ω/ Ω	

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Resistance – Generate, Fixed Values[3]	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω (1, 1.9) kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	0.011 % 99 μΩ/Ω 24 μΩ/Ω 24 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 89 μΩ/Ω 89 μΩ/Ω 90 μΩ/Ω 11 μΩ/Ω 12 μΩ/Ω 21 μΩ/Ω 22 μΩ/Ω 42 μΩ/Ω 49 μΩ/Ω 0.010 %	Fluke 5720A
Resistance – Generate	(0 to 10.999) Ω (11 to 32.999) Ω (33 to 109.999) Ω (110 to 329.999) Ω 330 Ω to 1.0999 kΩ (1.1 to 3.299) kΩ (3.3 to 10.999) kΩ (11 to 32.999) kΩ (33 to 109.99) kΩ (110 to 329.999) kΩ 330 kΩ to 1.0999 MΩ (1.1 to 3.299) MΩ (3.3 to 10.999) MΩ (11 to 32.999) MΩ (33 to 109.999) MΩ (110 to 329.999) MΩ (330 to 1100) MΩ	46 μΩ/Ω + 0.001 Ω 27 μΩ/Ω + 0.0015 Ω 24 μΩ/Ω + 0.0014 Ω 24 μΩ/Ω + 0.002 Ω 23 μΩ/Ω + 0.002 Ω 23 μΩ/Ω + 0.02 Ω 24 μΩ/Ω + 0.02 Ω 24 μΩ/Ω + 0.2 Ω 24 μΩ/Ω + 0.2 Ω 26 μΩ/Ω + 2 Ω 26 μΩ/Ω + 2 Ω 54 μΩ/Ω + 30 Ω 0.011 % + 50 Ω 0.022 % + 2.5 kΩ 0.039 % + 3 kΩ 0.24 % + 0.1 MΩ 1.2 % + 0.5 MΩ	Fluke 5522A

Parameter/Equipment	Frequency	CMC[2, 5, 6] (±)	Comments
AC High Voltage – Measure[3]			
Up to 21 kV (20 to 85) kV	60 Hz 60 Hz	0.71 % 0.99 %	Ross VD30 Ross VD120

Parameter/Equipment	Frequency	CMC[2, 6] (±)	Comments
AC Voltage – Measure[3]			
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	0.014 mV + 0.000 17 V/ V 0.0035 mV + 0.0003 V/V 0.004 mV + 0.000 12 V /V 0.002 mV + 0.000 11 V / V 0.002 mV + 0.000 11 V / V 0.008 mV + 0.000 34 V / V 0.02 mV + 0.000 77 V / V	Fluke 8508A
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 (100 to 300) kHz 300 kHz to 1 MHz	0.000 12 V + 0.000 15 V/V 0.000 021 V + 0.000 12 V/V 0.000 02 V + 0.000 093 V/V 0.000 021 V + 0.000 077 V/V 0.000 021 V + 0.000 11 V/V 0.000 04 V + 0.000 22 V/V 0.0002 V + 0.000 57 V/V 0.002 V + 0.003 V/V 0.02 V + 0.01 V/V	
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 (100 to 300) kHz 300 kHz to 1 MHz	0.0012 V + 0.0015 V/V 0.000 18 V + 0.0012 V/V 0.000 18 V + 0.000 91 V/V 0.0002 V + 0.000 075 V/V 0.0002 V + 0.000 11 V/V 0.0004 V + 0.000 22 V/V 0.002 V + 0.000 57 V/V 0.02 V + 0.003 V/V 0.2 V + 0.01 V/V	
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 (100 to 300) kHz 300 kHz to 1 MHz	0.012 V + 0.000 15 V/V 0.002 V + 0.000 12 V/V 0.002 V + 0.000 091 V/V 0.002 V + 0.000 076 V/V 0.002 V + 0.000 11 V/V 0.0068 V + 0.000 085 V/V 0.02 V + 0.000 57 V/V 0.2 V + 0.003 V/V 0.2 V + 0.003 V/V	
1000 V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.07 V + 0.000 15 V/V 0.021 V + 0.000 11 V/V 0.02 V + 0.000 12 V/V 0.04 V + 0.000 23 V/V 0.2 V + 0.000 58 V/V	

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Voltage – Generate[3]			
Up to 2.2 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.027 % + 4 µV 0.014 % + 4 µV 0.013 % + 4 µV 0.023 % + 4 µV 0.052 % + 5 µV 0.11 % + 10 µV 0.14 % + 20 µV 0.28 % + 20 µV	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	0.027 % + 4 µV 0.014 % + 4 µV 0.013 % + 4 µV 0.023 % + 4 µV 0.052 % + 5 µV 0.11 % + 10 µV 0.14 % + 20 µV 0.28 % + 20 µV	
(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	0.026 % + 12 µV 0.012 % + 7 µV 0.012 % + 7 µV 0.022 % + 7 µV 0.048 % + 17 µV 0.092 % + 20 µV 0.14 % + 25 µV 0.28 % + 45 µV	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.025 % + 40 µV 0.010 % + 15 µV 64 µV/V + 8 µV 89 µV/V + 10 µV 0.012 % + 30 µV 0.043 % + 80 µV 0.10 % + 200 µV 0.17 % + 300 µV	
(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	0.025 % + 400 µV 92 µV/V + 150 µV 46 µV/V + 50 µV 77 µV/V + 100 µV 0.010 % + 200 µV 0.028 % + 600 µV 0.10 % + 2 mV 0.15 % + 3.2 mV	
(22 to 220) V	(10 to 20) Hz	0.025 % + 4 mV	

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Voltage – Generate[3] (cont)			
(22 to 220) V	(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	0.011 % + 1.5 mV 79 µV/V + 0.6 mV 0.010 % + 1 mV 0.016 % + 2.5mV 0.092 % + 16 mV 0.45 % + 40 mV 0.82 % + 80 mV	Fluke 5720A
(220 to 330) V	45 Hz to 1kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.016 % + 2 mV 0.017 % + 6 mV 0.021 % + 6 mV 0.026 % + 6 mV 0.16 % + 50 mV	Fluke 5522A
(220 to 1100) V	50 Hz to 1 kHz	79 µV/V + 3.5 mV	Fluke 5720A
(330 to 1020) V	(1 to 5) kHz (5 to 10) kHz	0.021 % + 10 mV 0.025 % + 10 mV	Fluke 5522A
AC Current – Measure[3]			
Up to 200 µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.021 µA + 0.000 50 A/A 0.022 µA + 0.000 50 A/A 0.022 µA + 0.000 71 A/A	Fluke 8508A
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz 30 kHz to 100 kHz	0.0002 mA + 0.000 31 A/A 0.0002 mA + 0.000 31 A/A 0.0002 mA + 0.000 71 A/A 0.0002 mA + 0.004 A/A	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.0019 mA + 0.000 32 A/A 0.002 mA + 0.000 31 A/A 0.002 mA + 0.000 71 A/A 0.002 mA + 0.004 A/A	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.02 mA + 0.000 31 A/A 0.02 mA + 0.000 29 A/A 0.02 mA + 0.000 63 A/A	
100 mA to 1 A	(20 to 50) kHz 10 Hz to 2 kHz	1.2 % + 0.4 mA 0.0002 A + 0.000 62 A/A	HP 3458A opt 002
200 mA to 2 A	(2 to 10) kHz	0.0002 A + 0.000 74 A/A	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Current – Measure[3] (cont)			
200 mA to 2 A	(10 to 30) kHz	0.0002 A + 0.003 A/A	HP 3458A opt 002
(1 to 2) A	10 Hz to 5 kHz	0.03 %	Fluke 8508A with Fluke Y5020A
	(5 to 10) kHz	0.12 %	Fluke 8508A with Valhalla 2575A
(2 to 20) A	10 Hz to 5 kHz (5 to 10) kHz	0.09 % 0.58 %	Fluke 8508A, Fluke Y5020A, Valhalla 2575A
(20 to 100) A	10 Hz to 1 kHz	0.12 %	Fluke 8508A with Valhalla 2575A
AC Current – Generate[3]			
(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	0.026 % + 16 nA 0.017 % + 10 nA 0.013 % + 8 nA 0.029 % + 12 nA 0.11 % + 65 nA	Fluke 5720A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 40 nA 0.016 % + 35 nA 0.012 % + 35 nA 0.020 % + 110 nA 0.11 % + 650 nA	
(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	0.026 % + 0.4 µA 0.017 % + 0.35 µA 0.014 % + 0.35 µA 0.021 % + 0.55 µA 0.11 % + 6 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.026 % + 4 µA 0.017 % + 3.5 µA 0.012 % + 2.5 µA 0.021 % + 3.5 µA 0.11 % + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.028 % + 35 µA 0.047 % + 80 µA 0.071 % + 0.16 mA	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Current – Generate[3] (cont)			
(2.2 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.055 % + 2 mA 0.084 % + 2 mA 2.4 % + 5 mA	Fluke 5522A
(11 to 20) A	(45 to 100) Hz 100 Hz to 1 kHz	0.097 % + 5 mA 0.12 % + 5 mA	
	(1 to 10) kHz	0.58 %	Vallhalla 2555A with Vallhalla 2575A
(11 to 100) A	20 Hz to 1 kHz	0.12 %	
Clamp-On Only Toroidal (20 to 1000) A	(45 to 65) Hz (65 to 440) Hz	0.97 % + 0.09 A 1.4 % + 0.1 A	Fluke 5522A with Fluke 5500 coil
Non-Toroidal (20 to 1000) A	(45 to 65) Hz (65 to 440) Hz	1.3 % + 0.25 A 1.5 % + 0.9 A	
Capacitance – Generate[3]			
(220.0 to 399.9) pF	10 Hz to 10 kHz	0.64 % + 0.01 nF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.42 % + 0.01 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.42 % + 0.01 nF	
(3.3 to 10.2999) nF	10 Hz to 1 kHz	0.42 % + 0.01 nF	
(11 to 32.999) nF	10 Hz to 1 kHz	0.23 % + 0.1 nF	
(33 to 109.99) nF	10 Hz to 1 kHz	0.22 % + 0.1 nF	
(110 to 329.99) nF	10 Hz to 1 kHz	0.27 % + 0.3 nF	
(0.33 to 1.0999) µF	(10 to 600) Hz	0.21 % + 1 nF	
(1.1 to 3.2999) µF	(10 to 300) Hz	0.25 % + 3 nF	
(3.3 to 10.999) µF	(10 to 150) Hz	0.22 % + 10 nF	
(11 to 32.999) µF	(10 to 120) Hz	0.34 % + 30 nF	
(33 to 109.99) µF	(10 to 80) Hz	0.38 % + 100 nF	
(110 to 329.99) µF	(0 to 50) Hz	0.38 % + 300 nF	
(0.33 to 1.099) mF	(0 to 20) Hz	0.37 % + 1 µF	
(1.1 to 3.29) mF	(0 to 6) Hz	0.37 % + 3 µF	
(3.3 to 10.99) mF	(0 to 2) Hz	0.37 % + 10 µF	
(11 to 32.99) mF	(0 to 0.6) Hz	0.56 % + 30 µF	
(33 to 110) mF	(0 to 0.2) Hz	0.88 % + 100 µF	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
Capacitance – Generate[3] (cont)			
Fixed Points –			
1 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.038 % 0.039 % 0.058 % 0.12 % 0.2 % 0.31 % 1.2 % 2.2 %	HP 16381A
10 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.037 % 0.037 % 0.037 % 0.037 % 0.038 % 0.041 % 0.079 % 0.15 %	HP 16382A, 16383A
100 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.038 % 0.046 % 0.046 % 0.05 % 0.059 % 0.078 % 0.18 % 0.24 %	
1000 pF	1 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.037 % 0.068 % 0.079 % 0.15 % 0.19 % 0.25 % 0.61 % 0.86 %	HP 16384A
0.01 µF	(0.12, 1, 10, 100) kHz	0.13 %	HP 16385A
0.1 µF	(0.12, 1, 10, 100) kHz	0.13 %	HP 16386A
1 µF	(0.12, 1, 10, 100) kHz	0.13 %	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
Inductance – Generate[3]			
Fixed Points	100 µH (100 µH step) 1 mH (1 mH step) 10 mH (10 mH step) 100 mH (100 mH step)	2.3 % 2.4 % 2.4 % 1.2 %	Gen Rad 1490F
AC 4 Terminal Resistance – Generate			
1 mΩ 10 mΩ 100 mΩ 1 Ω	DC DC DC DC	0.23 % 0.23 % 0.23 % 0.23 %	Agilent 42030A
10 Ω	DC 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.12 % 0.12 % 0.13 % 0.14 % 0.14 % 0.16 % 0.42 % 0.62 %	
100 Ω	DC 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.12 % 0.12 % 0.13 % 0.13 % 0.13 % 0.13 % 0.24 % 0.33 %	
1 kΩ	DC 100 kHz 1 MHz 2 MHz 3 MHz 4 MHz 5 MHz 10 MHz 13 MHz	0.12 % 0.12 % 0.12 % 0.12 % 0.12 % 0.13 % 0.13 % 0.24 % 0.33 %	
10 kΩ	DC 100 kHz 1 MHz	0.12 % 0.12 % 0.12 %	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC 4 Terminal Resistance – Generate (cont)			
100 kΩ	DC 100 kHz 1 MHz	0.12 % 0.13 % 0.13 %	Agilent 42030A

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Oscilloscope – Generate[3]			
DC Signal			
50 Ω Load	1 mV to 6.6 V	0.19 % + 40 µV	Fluke 5500A SC600
1 MΩ Load	(0 to 130) V	0.039 % + 40 µV	
Squarewave Signal			
50 Ω Load	1.0 mV_{pk-pk} to 6.6 V_{pk-pk}	0.19 % + 40 µV	
1 MΩ Load	1.0 mV_{pk-pk} to 130 V_{pk-pk}	0.078 % + 40 µV***	*** > 1 kHz, uncertainty is 0.25 % + 40 µV
Edge Characteristics			
(50 Ω Load)	5 mV to 2.5 V	1.6 % + 0.2 mV	
Risetime			
(50 Ω Load)	≤ 300 ps	(+ 0 / -78) ps	
Level Sine Wave, Into 50 Ω Load 5 mV_{pk-pk} to 5.5 V_{pk-pk}	50 kHz reference	1.9 % + 0.3 mV	Fluke 5500A SC600
	50 kHz to 100 MHz	2.9 % + 0.3 mV	
	(100 to 300) MHz	3.3 % + 0.3 mV	
	(300 to 600) MHz	4.8 % + 0.3 mV	
Time Marker, 50 Ω	5 s to 50 ms	(25 + 1000*t*) µs/s	*t* = time in seconds
	20 ms to 2 ns	25 µs/s	
DC High Voltage – Generate[3]	Up to 10 kV	0.33 % of range	Fluke 410B

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Electrical Calibration of Thermocouple Indicating Devices[3] –			
Type E	(-250 to -100) °C (-100 to 650) °C (650 to 1000) °C	0.39 °C 0.14 °C 0.17 °C	Fluke 5500A
Type J	(-210 to -100) °C (-100 to 760) °C (760 to 1200) °C	0.21 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) °C (-100 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.20 °C 0.11 °C 0.15 °C 0.24 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.20 °C 0.11 °C 0.10 °C 0.15 °C	
Electrical Calibration of RTD Devices[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	0.04 °C 0.04 °C 0.05 °C 0.08 °C 0.08 °C 0.10 °C 0.19 °C	Fluke 5522A

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Attenuation (Tuned) – RF Power Measure[3]			
(10 to -100) dBm	2.5 MHz to 1.3 GHz	0.17 dB	HP 8902A with opt 050 & HP 11722A power sensor

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Attenuation (Tuned) – RF Power Measure[3] (cont)			
(10 to -100) dBm	(1.3 to 26.5) GHz	0.28 dB	HP 8902A w/ 11793A down converter & HP 11792A power sensor
(-100 to -120) dBm	(1.3 to 26.5) GHz	0.32 dB	
RF Absolute Power – Measure			
(-70 to -20) dB	10 MHz to 18 GHz	0.15 dB	HP 438A w/8481A/8482A/8484A/ 8485A
(-20 to 10) dB	100 kHz to 26.5 GHz	0.15 dB	
RF Power – Generate[3]			
(0 to -18) dBm	200 Hz to 81 MHz	0.05 dB	HP 3335A
(-18 to -58) dBm	200 Hz to 81 MHz	0.11 dB	
(-58 to -98) dBm	200 Hz to 81 MHz	0.23 dB	
(+10 to -100) dBm	2.5 MHz to 26.5 GHz	0.6 dB	HP 8340B synthesizer w/8902; 11722A, 11792A sensors, 11793A converter
Amplitude Modulation – Measure[3]			
Rate: 50 Hz to 10 kHz Depths: (5 to 99) %	150 kHz to 10 MHz	2.8 % + 1 digit	HP 8902A
Rate: 20 Hz to 10 kHz Depths: Up to 99 %	150 kHz to 10 MHz	3.8 % + 1 digit	
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	10 MHz to 1.3 GHz	1.7 % + 1 digit	
Rate: 20 Hz to 100 kHz Depths: (5 to 99) %	10 MHz to 1.3 GHz	3.7 % + 1 digit	HP 8902A
Rate: 50 Hz to 50 kHz Depths: (5 to 99) %	(1.3 to 18) GHz	3.2 % + 1 digit	HP 8902A, 11793A

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Amplitude Modulation – Measure[3] (cont)			
Rate: 20 Hz to 100 kHz Depths: Up to 99 %	10 MHz to 26.5 GHz	4.7 % + 1 digit	HP 8902A, 11793A
Frequency Modulation – Measure[3]			
Rate: 20 Hz to 10 kHz Dev: ≤ 40 kHz pk	150 kHz to 10 MHz	2.9 % + 1 digit	HP 8902A
Rate: 50 Hz to 100 kHz Dev: ≤ 400 kHz pk	10 MHz to 1.3 GHz	1.9 % + 1 digit	HP 8902A, 11793A
Rate: 20 Hz to 200 kHz Dev: ≤ 400 kHz pk	10 MHz to 1.3 GHz	6 % + 1 digit	
Rate: 50 Hz to 100 kHz Dev: ≤ 400 kHz pk	10 MHz to 26.5 GHz	3.5 % + 1 digit	
Phase Modulation – Measure[3]			
Rate: 200 Hz to 10 kHz	150 kHz ≤ f_c < 10 MHz	5.3 % + 1 digit	HP 8902A
Rate: 200 Hz to 20 kHz	10 MHz ≤ f_c ≤ 1.3 GHz	4.3 % + 1 digit	
Rate: 200 Hz to 20 kHz	10 MHz ≤ f_c ≤ 26.5 GHz	5.2 % + 1 digit	HP 8902A, 11793A f_c represents the frequency carrier
Harmonic Distortion/Total Harmonic Distortion – Measure	30 Hz to 26.5 GHz (2 to 6) GHz (6 to 13) GHz (13 to 21) GHz (21 to 26) GHz 20 Hz to 20 kHz (20 to 100) kHz	1.5 dB 1.7 dB 2.6 dB 2.9 dB 3.8 dB 1.2 dB 2.3 dB	HP 8563E HP 8903B

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Surge Generator[3] –			
Open Circuit Front Time Open Circuit Time to Half Value	(1.2 to 50) µs (1.2 to 50) µs	0.06 µs 1.3 µs	Tektronix TDS 460 & P 6015A, Pearson 110s
Open Circuit Front Time Open Circuit Time to Half Value	(10 to 700) µs (10 to 700) µs	0.06 µs 2.4 µs	
Short Circuit Front Time Short Circuit Time to Half Value	(8 to 20) µs (8 to 20) µs	0.24 µs 0.24 µs	
Short Circuit Front Time Short Circuit Time to Half Time	(5 to 320) µs (5 to 320) µs	0.17 µs 5.1 µs	
Open Circuit Voltage Short Circuit Current	10 V to 6 kV (0.125 to 3) kA	4.6 % 6.2 %	
Power Meters, Fixed Points[3] –			
Instrument Accuracy	(3, 10, 30, 100, 300) µW (1, 3, 10, 30, 100) mW	0.32 % 0.32 %	Range calibrator, Agilent 11683A

V. Mechanical

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Torque Wrench[3]	Up to 100 lbf·in Up to 240 lbf·in (20 to 650) lbf·ft	0.55 % 0.60 % 0.50 %	AKO TSD 1200, TSD 821, TSD 011 torque calibrator
Pressure & Vacuum Gages[3] –			
Pneumatic	(-14.5 to 30) psig (Up to 5) psig (Up to 100) psia	0.01 psi 0.004 psig 0.07 psia	Pressure calibrator, Fluke 525B w/750 sensors

Parameter/Equipment	Range	CMC[2, 4, 5, 8] (±)	Comments
Pressure & Vacuum Gages[3] – (cont) Hydraulic	 Up to 100 psig (100 to 1000) psig (1000 to 10 000) psig	 0.03 psi 0.25 psi 2.2 psi	 Pressure calibrator, Fluke 525B w/750 sensors
RPM – Measure[3] (Non-Contact)	(6 to 599.9) rpm (600 to 9999) rpm (10 000 to 99 999) rpm	1.2 rpm 0.6 rpm + 0.000 075 rpm/rpm 1.7 rpm + 0.000 073 rpm/rpm	Shimpo MT-200 optical tachometer
Scales[3]	(1 to 100) g (100 to 400) g (400 to 500) g (0.5 to 1.5) kg (1.5 to 2.5) kg (2.5 to 3.5) kg (3.5 to 8.5) kg (8.5 to 15) kg (15 to 60) kg (5 to 350) lb	0.0006 g 0.0009 g 0.003 g 0.009 g 0.013 g 0.016 g 0.031 g 0.059 g 0.020 g 0.0014 lb + 0.000 019 lb/lb	Class 2 weights Class F weights
Balances[3]	(50 to 500) mg (5 to 100) g	0.015 mg + 0.000 028 mg/mg 0.11 mg + 0.000 002 g/g	Class S weights
Torque Measuring Equipment - Cells / Standards	(1 to 100) lbf·in (1 to 650) lbf·ft	0.0073 % + 0.048 lbf·in 0.0089 % + 0.056 lbf·ft	Torque arm & class 6 weights
Force Measuring Equipment – Gages	Up to 300 lbf	0.044 % + 0.19 lbs	Class F weights

VI. Thermodynamics

Parameter/Equipment	Range	CMC[2, 5, 8] (±)	Comments
Temperature – Measure[3]	(-170 to 660) °C	0.023 °C	Hart 5626 PRT probe with Azonix 1011 display
Temperature – Measuring Equipment[3]	(35 to 200) °C	0.024 °C	Hart 5626 PRT with Azonix 1011 display, Hart 6102 bath
Relative Humidity – Measuring Equipment[3]	11.5 % 33 % 75 % (15 to 80) % RH	1.4 % 1.4 % 1.4 % 1.5 %	Salt w/Vaisala HMT-337 Tenney BTRC w/Vaisala HMT-337
Relative Humidity – Measure[3]	(10 to 90) % RH (90 to 95) % RH	1.4 % RH 2.1 % RH	Vaisala HMT-337

VII. Time & Frequency

Parameter/Equipment	Range	CMC[2, 4, 8] (±)	Comments
Timers & Stopwatches[3]	Seconds per day	0.07 s/day	Timometer TM-4500 from Helmut Klein
Frequency – Measuring Equipment, Fixed Point	10 MHz reference	4.1 parts in 10^{-11} Hz/Hz at 1 day	GPS with Symmetricom Xli
Frequency – Measuring Equipment	1 mHz to 100 Hz 100 Hz to 100 kHz 100 kHz to 100 MHz 100 MHz to 26.5 GHz	8.2 parts in 10^{-8} Hz/Hz 9.3 parts in 10^{-8} Hz/Hz 9 parts in 10^{-9} Hz/Hz 2.1 parts in 10^{-9} Hz/Hz	GPS with Symmetricom Xli w/HP 3325B HP8904A HP8648C HP8340B

Parameter/Equipment	Range	CMC[2, 4, 5, 8] (±)	Comments
Frequency – Measure	1 mHz to 100 Hz 100 Hz to 100 kHz 100 kHz to 100 MHz 100 MHz to 26.5 GHz	8.2 parts in 10^{-8} Hz/Hz 9.3 parts in 10^{-8} Hz/Hz 7.4 parts in 10^{-9} Hz/Hz 2.1 parts in 10^{-9} Hz/Hz	GPS with Symmetricom Xli w/HP53131A HP 5352B
Optical Tachometers	(10 to 100 000) rpm	0.0037 % + 6*R*	HP 3325B, HP 5334B, LED fixture

SATELLITE FACILITY

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I. Mechanical

Parameter/Equipment	Range	CMC[2] (±)	Comments
Weight Measure by Balances & Scales	(5 to 500) g >500 g to 5 kg >(5 to 10) kg >(10 to 60) kg	3.1 mg 38 mg 0.11 g 1.5 g	Mettler XP5003SDR Ohaus EX10202 & GP-61K

[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] In the statement of CMC, *L* is the numerical value of the nominal length of the device measured in inches; and *R* is the resolution of the device.

[5] In the statement of CMC, percentages are percentage of reading, unless otherwise indicated.

[6] The stated measured values are determined using indicated instruments (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 fixed floor specification.

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

[8] The type of instrument or material being calibrated is defined by the parameter. This indicates the laboratory is capable of calibrating instruments that measure or generate the values in the ranges indicated for the listed measurement parameter.

Accredited Laboratory

A2LA has accredited

TRU CAL INTERNATIONAL INC.

Bensenville, IL

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 31st day of May 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1278.01
Valid to March 31, 2026
Revised February 24, 2026

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