



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

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CALIBRATION

Valid To: June 30, 2024

Certificate Number: 5352.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1, 6}:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
DC Voltage – Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	6.7 μ V/V + 1.8 μ V 15 μ V/V + 0.95 μ V 16 μ V/V + 0.13 μ V 16 μ V/V + 4.0 μ V 16 μ V/V + 5.1 μ V	Digital multimeter
DC Current – Measure ³	Up to 100 nA 100 nA to 1 μ A (1 to 10) μ A (10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	110 nA/A + 0.68 nA 0.67 μ A/A + 0.68 nA 6.4 μ A/A + 0.69 nA 21 μ A/A + 0.97 nA 25 μ A/A + 3.9 nA 25 μ A/A + 39 nA 43 μ A/A + 0.30 μ A 130 μ A/A + 4.7 μ A	Digital multimeter
DC Voltage – Generate ³	Up to 220 mV 220 mV to 2.2 V (2.2 to 11) V (2.2 to 22) V (22 to 220) V (220 to 1100) V	4.9 μ V/V + 0.74 μ V 4.8 μ V/V + 0.37 μ V 3.5 μ V/V + 0.59 μ V 3.5 μ V/V + 0.36 μ V 5.0 μ V/V + 8.7 μ V 6.4 μ V/V + 81 μ V	Multifunction calibrator

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
DC Current – Generate ³	Up to 220 μ A 220 μ A 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) A	20 μ A/A + 6.3 nA 31 μ A/A + 11 nA 31 μ A/A + 96 nA 43 μ A/A + 400 nA 75 μ A/A + 12 μ A 260 μ A/A + 280 μ A 990 μ A/A + 270 μ A	Multifunction calibrator, amplifier
4 Wire Resistance – Measure ³	Up to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 to 10) k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	12 $\mu\Omega/\Omega$ + 160 $\mu\Omega$ 16 $\mu\Omega/\Omega$ + 1 m Ω 17 $\mu\Omega/\Omega$ + 390 $\mu\Omega$ 17 $\mu\Omega/\Omega$ + 3.9 m Ω 17 $\mu\Omega/\Omega$ + 38 m Ω 20 $\mu\Omega/\Omega$ + 3.1 Ω 81 $\mu\Omega/\Omega$ + 63 Ω 1.2 m Ω/Ω + 650 Ω 12 m Ω/Ω + 64 k Ω	Digital multimeter
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 k Ω (1.1 to 3.3) k Ω (3.3 to 11) k Ω (11 to 33) k Ω (33 to 110) k Ω (110 to 330) k Ω 330 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω (330 to 1100) M Ω	0.88 $\mu\Omega/\Omega$ + 0.01 Ω 1.3 $\mu\Omega/\Omega$ + 0.015 Ω 3.7 $\mu\Omega/\Omega$ + 0.015 Ω 8.2 $\mu\Omega/\Omega$ + 0.019 Ω 19 $\mu\Omega/\Omega$ + 0.016 Ω 8.2 $\mu\Omega/\Omega$ + 0.19 Ω 24 $\mu\Omega/\Omega$ + 0.059 Ω 8.5 $\mu\Omega/\Omega$ + 0.046 Ω 24 $\mu\Omega/\Omega$ + 0.59 Ω 18 $\mu\Omega/\Omega$ + 8.7 Ω 28 $\mu\Omega/\Omega$ + 5.4 Ω 38 $\mu\Omega/\Omega$ + 120 Ω 120 $\mu\Omega/\Omega$ + 91 Ω 220 $\mu\Omega/\Omega$ + 1.4 k Ω 500 $\mu\Omega/\Omega$ + 0.70 k Ω 3.0 m Ω/Ω + 21 k Ω 15 m Ω/Ω + 53 k Ω	Multifunction calibrator

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Resistance – Generate ³ (cont)	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	51 $\mu\Omega$ 100 $\mu\Omega$ 180 $\mu\Omega$ 250 $\mu\Omega$ 460 $\mu\Omega$ 1.0 m Ω 1.9 m Ω 6.8 m Ω 13 m Ω 67 m Ω 130 m Ω 880 m Ω 1.7 Ω 14 Ω 35 Ω 420 Ω 940 Ω 11 k Ω	Multifunction calibrator
Capacitance ³ – Generate	(220 to 400) pF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF (.33 to 1.1) μ F (1.1 to 3.3) μ F (3.3 to 11) μ F (11 to 33) μ F (33 to 110) μ F (110 to 330) μ F (.33 to 1.1) mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	0.075 % + 10 pF 0.17 % + 9.8 pF 0.35 % + 7.6 pF 0.21 % + 6.8 pF 0.24 % + 3.6 pF 0.82 % + 9.9 pF 0.24 % + 41 pF 0.20 % + 750 pF 0.21 % + 1.9 nF 0.20 % + 7.5 nF 0.37 % + 16 nF 0.41 % + 60 nF 0.41 % + 170 nF 0.41 % + 0.56 μ F 0.42 % + 1.2 μ F 0.42 % + 4.0 μ F 0.73 % + 7.8 μ F 1.1 % + 18 μ F	Multifunction calibrator

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage – Measure ³			
Up 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 to 300) kHz	3.1 $\mu\text{V/V} + 0.22 \mu\text{V}$ 1.4 $\mu\text{V/V} + 0.22 \mu\text{V}$ 3.1 $\mu\text{V/V} + 0.22 \mu\text{V}$ 28 $\mu\text{V/V} + 0.26 \mu\text{V}$ 0.69 mV/V + 0.26 μV 29 mV/V + 0.24 μV	Digital multimeter
(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 1 to 2 MHz	62 $\mu\text{V/V} + 2.3 \mu\text{V}$ 57 $\mu\text{V/V} + 3.2 \mu\text{V}$ 140 $\mu\text{V/V} + 2.6 \mu\text{V}$ 330 $\mu\text{V/V} + 1.7 \mu\text{V}$ 0.92 mV/V + 0.76 μV 3.4 mV/V + 2.2 μV 12 mV/V + 0.67 μV 46 mV/V + 0.65 μV	
100 mV 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 (1 to 2) MHz	51 $\mu\text{V/V} + 42 \mu\text{V}$ 66 $\mu\text{V/V} + 18 \mu\text{V}$ 150 $\mu\text{V/V} + 13 \mu\text{V}$ 340 $\mu\text{V/V} + 7.9 \mu\text{V}$ 0.92 mV/V + 0.0032 mV 3.5 mV/V + 0.021 mV 12 mV/V + 0.0064 mV 17 mV/V + 0.0043 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 300 kHz to 1 MHz (1 to 2) MHz	50 $\mu\text{V/V} + 440 \mu\text{V}$ 66 $\mu\text{V/V} + 180 \mu\text{V}$ 150 $\mu\text{V/V} + 130 \mu\text{V}$ 340 $\mu\text{V/V} + 77 \mu\text{V}$ 0.92 mV/V + 0.032 mV 3.5 mV/V + 0.21 mV 12 mV/V + 0.063 mV 17 mV/V + 0.044 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	0.20 mV/V + 3.1 mV 0.22 mV/V + 1.1 mV 0.22 mV/V + 1.1 mV 0.40 mV/V + 0.68 mV 1.4 mV/V + 0.22 mV 4.6 mV/V + 1.6 mV 17 mV/V + 0.42 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.44 mV/V + 21 mV 0.46 mV/V + 6.0 mV 0.69 mV/V + 4.1 mV 1.4 mV/V + 2.1 mV 3.5 mV/V + 1.1 mV	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	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 to 1 MHz	8.5 μ V/V + 7.5 μ V 1.2 μ V/V + 7.5 μ V 0.94 μ V/V + 7.5 μ V 5.9 μ V/V + 7.5 μ V 33 μ V/V + 8.3 μ V 100 μ V/V + 12 μ V 100 μ V/V + 21 μ V 370 μ V/V + 21 μ V	Multifunction calibrator
(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 to 1 MHz	81 μ V/V + 7.5 μ V 13 μ V/V + 7.5 μ V 10 μ V/V + 7.5 μ V 59 μ V/V + 7.5 μ V 270 μ V/V + 7.9 μ V 690 μ V/V + 11 μ V 780 μ V/V + 21 μ V 2.0 mV/V + 20 μ V	
(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	180 μ V/V + 15 μ V 50 μ V/V + 13 μ V 27 μ V/V + 11 μ V 85 μ V/V + 10 μ V 250 μ V/V + 17 μ V 590 μ V/V + 18 μ V 1.3 mV/V + 21 mV 2.6 mV/V + 24 mV	
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	230 μ V/V + 18 μ V 85 μ V/V + 13 μ V 36 μ V/V + 15 μ V 58 μ V/V + 23 μ V 76 μ V/V + 23 μ V 320 μ V/V + 47 μ V 690 μ V/V + 100 μ V 1.6 mV/V + 170 μ V	
(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	190 μ V/V + 1.5 mV 66 μ V/V + 690 μ V 25 μ V/V + 550 μ V 49 μ V/V + 510 μ V 64 μ V/V + 520 μ V 230 μ V/V + 510 μ V 940 μ V/V + 1.4 μ V 1.4 mV/V + 1.9 μ V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Generate ³ (cont)			
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	190 μ V/V + 15 mV 41 μ V/V + 19 mV 36 μ V/V + 4.8 mV 69 μ V/V + 3.0 mV 130 μ V/V + 6.1 mV 870 μ V/V + 8.3 mV 4.4 mV/V + 9.4 mV 7.9 mV/V + 19 mV	Multifunction calibrator
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	280 μ V/V + 22 mV 61 μ V/V + 13 mV	
AC Current – Generate ³			
Up to 220 μ A	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	190 μ A/A + 0.016 μ A 100 μ A/A + 0.016 μ A 58 μ A/A + 0.014 μ A 220 μ A/A + 0.016 μ A 820 μ A/A + 0.073 μ A	Multifunction calibrator
220 μ A 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	200 μ A/A + 0.13 μ A 300 μ A/A + 0.056 μ A 74 μ A/A + 0.083 μ A 160 μ A/A + 0.11 μ A 910 μ A/A + 0.51 μ A	
(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	170 μ A/A + 2.2 μ A 120 μ A/A + 1.1 μ A 74 μ A/A + 0.83 μ A 170 μ A/A + 0.77 μ A 960 μ A/A + 3.6 μ A	
(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	170 μ A/A + 23 μ A 120 μ A/A + 11 μ A 75 μ A/A + 8.0 μ A 160 μ A/A + 9.7 μ A 1.1 mA/A + 7.1 μ A	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	200 μ A/A + 110 μ A 410 μ A/A + 91 μ A 7.0 μ A/A + 29 μ A	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Current – Generate ³ (cont)			
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	460 μ A/A + 21 μ A 950 μ A/A + 43 μ A 3.6 mA/A + 43 μ A	Multifunction calibrator
(3 to 20.5) A	(10 to 100) Hz 100 Hz to 1 kHz	1.7 mA/A + 710 μ A 10 mA/A + 490 μ A	
AC Current – Measure ³			
Up to 100 μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	560 μ A/A + 2.1 μ A 80 mA/A + 2.1 mA 13 mA/A + 2.1 mA 13 mA/A + 3.8 mA	Digital multimeter
100 μ A to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	3.3 mA/A + 1.8 μ A 690 μ A/A + 2.0 μ A 120 μ A/A + 2.1 μ A 31 μ A/A + 2.1 μ A 120 μ A/A + 2.1 μ A 3.2 mA/A + 1.8 μ A 4.6 mA/A + 2.3 μ A	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	4.5 mA/A + 1.0 μ A 1.6 mA/A + 2.0 μ A 490 μ A + 2.7 μ A 170 μ A + 2.9 μ A 490 μ A + 2.7 μ A 4.4 mA/A + 2.4 μ A 5.3 mA/A + 13 μ A	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz (50 to 100) kHz	4.6 mA/A + 6.0 μ A 1.6 mA/A + 13 μ A 540 μ A/A + 19 μ A 200 μ A/A + 21 μ A 540 μ A/A + 19 μ A 4.4 mA/A + 21 μ A 5.3 mA/A + 130 μ A	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	4.6 mA/A + 60 μ A 1.7 mA/A + 120 μ A 780 μ A/A + 170 μ A 1.0 mA/A + 160 μ A 3.4 mA/A + 76 μ A 11 mA/A + 98 μ A	

II. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Pressure Gages ³	(50 to 1000) psig (500 to 10 000) psig	0.0024 % rdg + 0.000 16 psi 0.0025 % rdg + 0.0015 psi	Dead weight tester
Vacuum Gages ³	(0 to 30) inHg	0.17 % + 0.025 inHg	Mensor display and modules
Torque Analyzers and Transducers ³	8 oz·in to 2000 lb·ft	0.012 % rdg + 0.024 oz·in	Class 6 weights, test bars and wheels
Torque Wrenches, Watches and Drivers ³	(0.15 to 9) lbf·in (1.5 to 90) lbf·in (20 to 200) lbf·in (10 to 100) lbf·ft (5 to 50) ozf·in (10 to 100) ozf·in (5 to 50) lbf·in (30 to 400) lbf·in (80 to 1000) lbf·in (20 to 250) lbf·ft (60 to 600) lbf·ft (200 to 2000) lbf·ft	0.0006 % rdg + 0.53 lbf·in 0.0007 % rdg + 0.53 lbf·in 0.29 % rdg + 0.012 lbf·in 0.28 % rdg + 0.27 lbf·in 0.26 % rdg + 0.000 96 ozf·in 0.53 % rdg + 0.0031 ozf·in 0.26 % rdg + 0.015 lbf·in 0.29 % rdg + 0.0049 lbf·in 0.29 % rdg + 0.017 lbf·in 0.29 % rdg + 0.080 lbf·ft 0.29 % rdg + 0.036 lbf·ft 0.29 % rdg + 0.010 lbf·ft	Torque analyzers
Cable Tension Measurement	(30 to 600) lbf (200 to 2000) lbf	0.29 % rdg + 0.049 lbf 0.29 % rdg + 0.019 lbf	Multitest analyzer
Force Gages and Load Cells ³	1/32 ozf to 10 lbf (5 to 500) lbf	0.012 % rdg 0.01 % rdg	Class 6 weights

III. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature Liquid Filled, Bi-Metal and Digital Thermometers ³	(-197 to -80) °C (> -80 to -38.834) °C (> -38.834 to 0.010) °C (> 0.010 to 156.599) °C (> 156.599 to 231.928) °C (> 231.928 to 419.527) °C (> 419.527 to 660.323) °C	0.012 °C 0.012 °C 0.011 °C 0.0092 °C 0.011 °C 0.014 °C 0.024 °C	PRTs
IR Thermometers ³	(35 to 550) °C	0.25 % rdg + 0.19 °C	Blackbody

IV. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Frequency – Measure ³	10 MHz	35 µHz	Truetime time and frequency receiver
	100 Hz to 225 MHz 10 Hz to 26.5 GHz	0.83 nHz/Hz + 0.73 µHz 0.19 pHz/Hz + 9.8 Hz	Frequency counter
Frequency – Generate ³	1 Hz to 2 MHz	2.3 µHz/Hz	Truetime time and frequency receiver, frequency generator
	2 MHz to 6 GHz	0.023 nHz/Hz + 0.36 µHz	
	(6 to 26.5) GHz	0.014 nHz/Hz + 0.017 nHz	

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 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.
- ⁵ 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.
- ⁶ This scope meets A2LA's *P112 Flexible Scope Policy*.



Accredited Laboratory

A2LA has accredited

M & M METROLOGY, INC.

Deerfield Beach, FL

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 28th day of September 2022.

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 5352.01
Valid to June 30, 2024

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