SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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CALIBRATION

Valid To: May 31, 2025 Certificate Number: 5056.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Caliper –			
Outside	(0.1 to 0.125) mm (0.125 to 15) mm (15 to 75) mm (75 to 100) mm (100 to 140) mm (140 to 200) mm (200 to 300) mm	5.8 µm 0.33 µm/m + 5.8 µm 0.06 µm/m + 5.8 µm 0.05 µm/m + 5.8 µm 0.03 µm/m + 5.8 µm 0.06 µm/m + 5.8 µm 0.08 µm/m + 5.8 µm	MS-0035630
Inside	(0.1 to 5) mm (5 to 10) mm (10 to 25) mm	72 µm/m + 5.8 µm 38 µm/m + 5.8 µm 18 µm/m + 5.8 µm	
Depth	(0.1 to 5) mm (5 to 15) mm (15 to 75) mm	150 µm/m + 5.8 µm 51 µm/m + 5.8 µm 11 µm/m + 5.8 µm	
Step	(0.1 to 5) mm (5 to 15) mm (15 to 75) mm	120 µm/m + 5.8 µm 40 µm/m + 5.8 µm 7.9 µm/m + 5.8 µm	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Micrometer	(0.1 to 1) mm (1 to 5) mm (5 to 10) mm (10 to 25) mm (25 to 100) mm (100 to 200) mm (200 to 300) mm	44 µm/m + 0.58 µm 9.5 µm/m + 0.58 µm 4.4 µm/m + 0.58 µm 2 µm/m + 0.58 µm 0.33 µm/m + 0.58 µm 0.52 µm/m + 0.58 µm 0.69 µm/m + 0.58 µm	MS-0035630
Microscope	Up to 0.4 mm (0.4 to 1.6) mm (1.6 to 8) mm (8 to 10) mm (10 to 50) mm (50 to 100) mm (100 to 170) mm (170 to 200) mm	610 µm/m + 0.13 µm 150 µm/m + 0.13 µm 36 µm/m + 0.13 µm 18 µm/m + 0.13 µm 7.6 µm/m + 0.24 µm 2.5 µm/m + 0.24 µm 2 µm/m + 0.24 µm 1.5 µm/m + 0.24 µm	MS-0035631
Linear Dimensions - Measure	Up to 0.4 mm (0.4 to 1.6) mm (1.6 to 8) mm (8 to 50) mm (50 to 100) mm (100 to 170) mm (170 to 200) mm Up to 500 mm (500 to 1000) mm (1000 to 1500) mm	1.4 mm/m + 1 µm 370 µm/m + 1 µm 82 µm/m + 1 µm 49 µm/m + 1 µm 26 µm/m + 1 µm 15 µm/m + 1 µm 16 µm/m + 1 µm 520 µm/m + 5.8 µm 350 µm/m + 5.8 µm 290 µm/m + 5.8 µm	MS-0035630 Measuring Microscope Digital Caliper
Angle	(0 to 360) °	0.034 °	MS-0035630
Radius	Up to 0.3 mm (0.3 to 0.63) mm (0.63 to 1.8) mm (1.8 to 5) mm (5 to 10) mm (10 to 50) mm (50 to 100) mm	11 mm/m + 3.1 µm 4 mm/m + 3.1 µm 1.4 mm/m + 3.1 µm 470 µm/m + 1 µm 240 µm/m + 1 µm 48 µm/m + 1 µm 24 µm/m + 1 µm	MS-0035630

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Voltage – Generate[3]	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1 to 10) kV	10 µV/V + 2.4 µV 8.1 µV/V + 2.4 µV 9.9 µV/V + 2.4 µV 20 µV/V + 2.4 µV 15 µV/V + 2.4 µV 5.1 mV/V	MS-0020876
DC Voltage – Measure[3]	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V (1 to 10) kV	1.3 µV/V + 2.3 µV 2.5 µV/V + 3.2 µV 2.5 µV/V + 29 µV 4.5 µV/V + 300 µV 3.6 µV/V + 3.3 mV 5.1 mV/V + 3.1 mV	MS-0020875
DC Current – Generate[3]	(0 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA (200 to 500) mA 500 mA to 2 A (2 to 20) A (20 to 100) A	120 µA/A + 0.02 µA 72 µA/A + 0.04 µA 77 µA/A + 0.2 µA 76 µA/A + 2 µA 150 µA/A + 31 µA 300 µA/A + 31 µA 800 µA/A + 31 µA 82 µA/A + 7.6 mA	MS-0020879
DC Current – Generate[3] (Current Coil)	(0 to 200) A (200 to 400) A (400 to 550) A (550 to 1025) A (1025 to 2500) A	200 µA/A + 17 mA 200 µA/A + 3.3 mA 3.9 mA/A + 390 mA 3.9 mA/A + 390 mA 5.6 mA/A + 11 mA	MS-0020879
DC Current – Measure[3]	(0 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (20 to 100) A (100 to 400) A (240 to 500) A (500 to 2000) A	12 µA/A + 0.45 nA 12 µA/A + 0.46 nA 14 µA/A + 45 nA 40 µA/A + 2.8 µA 200 µA/A + 28 µA 300 µA/A + 2.8 mA 600 µA/A + 5.8 mA 600 µA/A + 23 mA 5.8 mA/A + 0.29 A 18 mA/A + 5.8 A	MS-0020878

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
DC Power – Generate[3]			MS-0035460
(0.033 to 1000) V			Remark: CMC is RSS of voltage and current setting
(0.33 to 330) mA	0.011 mW to 330 W	78 µW/W	
(0.33 to 3) A	11 mW to 3000 W	160 µW/W	
(3 to 20) A	99 mW to 20 kW	310 µW/W	
(20 to 50) A	0.66 W to 50 kW	320 µW/W	
(50 to 100) A	1.65 W to 100 kW	350 µW/W	
(100 to 2500) A	4 W to 2500 kW	2.9 mW/W	
Resistance – Generate[3]	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ	31 µΩ/Ω + 800 µΩ 23 µΩ/Ω + 1.2 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 200 mΩ 25 µΩ/Ω + 1.55 Ω 46 µΩ/Ω + 23 Ω 193 µΩ/Ω + 1.9 kΩ 2.3 mΩ/Ω + 77 kΩ 12 mΩ/Ω + 400 kΩ	MS-0020977
Resistance – Measure[3]	(0 to 41) mΩ 41 mΩ to 2 Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	18 µΩ/Ω + 60 nΩ 20 µΩ/Ω + 5 µΩ 9.1 µΩ/Ω + 30 µΩ 7.0 µΩ/Ω + 300 µΩ 7.0 µΩ/Ω + 3 mΩ 7.0 µΩ/Ω + 30 mΩ 7.0 µΩ/Ω + 300 mΩ 9.2 µΩ/Ω + 1 Ω 20 µΩ/Ω + 100 Ω 20 µΩ/Ω + 100 Ω 63 µΩ/Ω + 30 kΩ 1.5 mΩ/Ω + 1 MΩ	MS-0020976

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3]			
(0 to 33) mV	(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 500) kHz	620 µV/V + 4.7 µV 120 µV/V + 4.7 µV 120 µV/V + 4.7 µV 120 µV/V + 4.7 µV 800 µV/V + 4.7 µV 2.7 mV/V + 9.3 µV 6.2 mV/V + 39 µV	MS-0020876
(33 to 200) mV	(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 500) kHz	230 µV/V + 6.2 µV 110 µV/V + 6.2 µV 110 µV/V + 6.2 µV 120 µV/V + 6.2 µV 270 µV/V + 6.2 µV 620 µV/V + 25 µV 1.6 mV/V + 54 µV	
200 mV to 2 V	(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	230 µV/V + 39 µV 120 µV/V + 47 µV 120 µV/V + 47 µV 120 µV/V + 47 µV 230 µV/V + 39 µV 540 µV/V + 97 µV 1.9 mV/V + 500 µV 1.9 mV/V + 500 µV	
(2 to 20) V	(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	0.23 mV/V + 0.51 mV 0.12 mV/V + 0.47 mV 0.12 mV/V + 0.47 mV 0.12 mV/V + 0.47 mV 0.2 mV/V + 0.47 mV 0.7 mV/V + 1.2 mV 0.7 mV/V + 1.2 mV 0.7 mV/V + 1.2 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Generate[3] (cont)			
(20 to 200) V	(10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	0.15 mV/V + 2 mV 0.15 mV/V + 2 mV 0.2 mV/V + 5 mV 0.2 mV/V + 5 mV 0.23 mV/V + 5 mV 0.2 mV/V + 39 mV	MS-0020876
(200 to 330) V	45 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	0.2 mV/V + 5 mV 0.23 mV/V + 5 mV 1.6 mV/V + 39 mV	
(200 to 1000) V	45 Hz to 10 kHz	0.23 mV/V + 9.7 mV	
(1 to 10) kV	(50 / 60) Hz	7 mV/V	
AC Voltage – Measure[3]			
(0 to 200) mV	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz	200 µV/V + 14 µV 140 µV/V + 5 µV 120 µV/V + 5 µV 110 µV/V + 3 µV 140 µV/V + 5 µV 350 µV/V + 8.4 µV 780 µV/V + 21 µV	MS-0020875
(0.2 to 2) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	200 µV/V + 120 µV 110 µV/V + 30 µV 87 µV/V + 30 µV 72 µV/V + 30 µV 110 µV/V + 30 µV 220 µV/V + 50 µV 600 µV/V + 0.21 mV 3.1 mV/V + 2 mV 10 mV/V + 20 mV	
(2 to 20) V	(1 to 10) Hz (10 to 40) Hz	200 µV/V + 1.2 mV 110 µV/V + 0.30 mV	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Voltage – Measure[3] (cont)			
(2 to 20) V	(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	87 µV/V + 0.30 mV 72 µV/V + 0.30 mV 110 µV/V + 0.30 mV 220 µV/V + 0.45 mV 600 µV/V + 2 mV 3.1 mV/V + 20 mV 10 mV/V + 200 mV	MS-0020875
(20 to 200) V	(1 to 10) Hz (10 to 40) Hz (40 to 100) Hz 100 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz (30 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	200 µV/V + 12 mV 110 µV/V + 3 mV 87 µV/V + 3 mV 72 µV/V + 3 mV 110 µV/V + 3 mV 220 µV/V + 5 mV 600 µV/V + 21 mV 3.1 mV/V + 200 mV 10 mV/V + 2 V	
(200 to 1000) V	(1 to 10) Hz (10 to 40) Hz 40 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	200 µV/V + 74 mV 110 µV/V + 30 mV 110 µV/V + 30 mV 230 µV/V + 50 mV 600 µV/V + 210 mV	
(1 to 10) kV	(50 / 60) Hz	10 mV/V + 5.1 mV	
AC Current – Generate[3]			
(29 to 200) µA	10 Hz to 10 kHz (10 to 30) kHz	6.2 mA/A + 0.15 µA 12 mA/A + 31 µA	MS-0020879
(200 to 330) µA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	6.2 mA/A + 0.15 µA 1 mA/A + 0.08 µA 6.2 mA/A + 0.15 µA 1.2 mA/A + 31 µA	
(0.33 to 2) mA	10 Hz to 10 kHz (10 to 30) kHz	3.9 mA/A + 0.23 µA 7.7 mA/A + 0.46 µA	
(2 to 3.3) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	2 mA/A + 0.12 µA 2 mA/A + 0.12 µA 800 µA/A + 0.12 µA 3.9 mA/A + 0.23 µA 7.8 mA/A + 0.46 µA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3] (cont)			
(3.3 to 20) mA	10 Hz to 10 kHz (10 to 30) kHz	2 mA/A + 2.4 µA 3.1 mA/A + 3.2 µA	MS-0020879
(20 to 33) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.4 mA/A + 1.7 µA 0.69 mA/A + 1.7 µA 0.61 mA/A + 1.7 µA 0.61 mA/A + 1.7 µA 2 mA/A + 2.4 µA 3.1 mA/A + 3.2 µA	
(33 to 200) mA	10 Hz to 10 kHz (10 to 30) kHz	1.6 mA/A + 78 µA 3.1 mA/A + 160 µA	
(200 to 330) mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	1.4 mA/A + 17 µA 700 µA/A + 17 µA 310 µA/A + 78 µA 800 µA/A + 39 µA 1.5 mA/A + 78 µA 3.1 mA/A + 160 µA	
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 2) kHz (2 to 10) kHz	1.4 mA/A + 78 µA 400 mA/A + 78 µA 4.7 mA/A + 0.77 mA 20 mA/A + 3.9 mA	
(1.1 to 2) A	(1.210 to 2) kHz (2 to 10) kHz	4.7 mA/A + 0.77 mA 20 mA/A + 3.9 mA	
(2 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 2) kHz (2 to 10) kHz	0.5 mA/A + 1.6 mA 0.8 mA/A + 1.6 mA 23 mA/A + 1.6 mA 23 mA/A + 1.6 mA	
(3 to 11) A	(10 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz (1 to 2) kHz (2 to 5) kHz (5 to 6) kHz (6 to 10) kHz	0.5 mA/A + 1.6 mA 0.5 mA/A + 1.6 mA 0.8 mA/A + 1.6 mA 23 mA/A + 1.6 mA 23 mA/A + 1.6 mA 23 mA/A + 1.6 mA 23 mA/A + 1.6 mA	
(11 to 20) A	(10 to 65) Hz (65 to 300) Hz 300 Hz to 2 kHz (2 to 5) kHz (5 to 6) kHz (6 to 10) kHz	1.0 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3] (cont)			
(20 to 120) A	(10 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz (3 to 6) kHz (6 to 10) kHz	1.0 mA/A + 3.9 mA 1.2 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA 23 mA/A + 3.9 mA	MS-0020879
AC Current – Generate[3] (Current Coil)			
(10 to 16.5) A	(10 to 45) Hz (45 to 65) Hz (65 to 100) Hz (100 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz (3 to 6) kHz (6 to 10) kHz	5.6 mA/A + 11 mA 2.2 mA/A + 2.8 mA 6.1 mA/A + 2.8 mA 5.6 mA/A + 11 mA 6 mA/A + 11 mA 9.2 mA/A + 16 mA 21 mA/A + 16 mA 57 mA/A + 16 mA	MS-0020879
(16.5 to 50) A	(10 to 45) Hz (45 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz (3 to 6) kHz (6 to 10) kHz	250 µA/A + 79 mA 2.3 mA/A + 22 mA 5.6 mA/A + 11 mA 6 mA/A + 11 mA 9.2 mA/A + 16 mA 21 mA/A + 16 mA 57 mA/A + 16 mA	
(50 to 100) A	(10 to 45) Hz (45 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz (3 to 6) kHz	250 µA/A + 79 mA 250 µA/A + 79 mA 470 µA/A + 110 mA 6 mA/A + 11 mA 9.2 mA/A + 16 mA 21 mA/A + 16 mA	
(100 to 240) A	(10 to 45) Hz (45 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz	250 µA/A + 79 mA 250 µA/A + 79 mA 470 µA/A + 110 mA 1.6 mA/A + 380 mA 9.2 mA/A + 16 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Generate[3] (Current Coil) (cont)			
(240 to 300) A	(10 to 45) Hz (45 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz (1 to 3) kHz	5.6 mA/A + 11 mA 2.4 mA/A + 100 mA 5.6 mA/A + 11 mA 6 mA/A + 11 mA 9.2 mA/A + 16 mA	MS-0020879
(300 to 1000) A	(10 to 45) Hz (45 to 65) Hz (65 to 300) Hz 300 Hz to 1 kHz	5.6 mA/A + 11 mA 2.4 mA/A + 100 mA 5.6 mA/A + 11 mA 6 mA/A + 11 mA	
(1000 to 3000) A	(10 to 300) Hz	5.6 mA/A + 11 mA	
AC Current – Measure[3]			
(0 to 200) µA	1 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	500 µA/A+ 0.03 µA 700 µA/A+ 0.03 µA 4 mA/A+ 0.03 µA	MS-0020878
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz (30 to 100) kHz	300 µA/A+ 0.30 µA 300 µA/A+ 0.30 µA 700 µA/A+ 0.30 µA 4.0 mA/A+ 0.30 µA	
(1 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz	300 µA/A+ 3.0 µA 300 µA/A+ 3.0 µA	
(2 to 20) mA	(10 to 30) kHz (30 to 100) kHz	700 µA/A+ 3.0 µA 4.0 mA/A+ 3.0 µA	
(20 to 200) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	300 µA/A+ 30 µA 300 µA/A+ 30 µA 600 µA/A+ 30 µA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	600 µA/A+ 0.30 mA 710 µA/A+ 0.30 mA 3.0 mA/A+ 0.30 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	800 µA/A+ 3.0 mA 2.5 mA/A+ 3.0 mA	
(20 to 50) A	(16 to 400) Hz	600 µA/A + 5.8 mA	
(50 to 200) A	(16 to 400) Hz	600 µA/A + 23 mA	

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
AC Current – Measure[3] (cont.)			
(200 to 500) A	(45 to 65) Hz	5.8 mA/A + 0.29 A	MS-0020878
(500 to 1400) A	(45 to 65) HZ	18 mA/A + 5.8 A	
AC Power – Generate[3]			
0.011 mW to 330 W	10 Hz to 30 kHz, (0.033 to 1000) V, (0.33 to 330) mA	330 µW/W	MS-0035460 Remark: CMC is RSS of Voltage, Current and Phase setting
11 mW to 3000 W	10 Hz to 10 kHz, (0.033 to 1000) V, (0.33 to 3) A	400 µW/W	
99 mW to 20 kW	10 Hz to 10 kHz, (0.033 to 1000) V, (3 to 20) A	510 µW/W	
0.66 W to 60 kW	10 Hz to 10 kHz, (0.033 to 1000) V, (20 to 60) A	780 µW/W	
1.65 W to 120 kW	10 Hz to 10 kHz, (0.033 to 1000) V, (50 to 120) A	1.3 mW/W	
4 W to 3000 kW	(10 to 300) Hz, (0.033 to 1000) V, (120 to 3000) A	3.1 mW/W	
Phase – Generate[3]			
(0 to ± 180) °	(10 to 65) Hz (65 to 500) Hz 500 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.1° 0.26° 0.51° 2.6° 5.1° 10°	MS-0035460

Parameter/Range	Frequency	CMC[2, 4] (±)	Comments
Capacitance – Generate[3]	(220 pF to 3.3) nF (3.3 to 11) nF (11 to 110) nF (110 to 330) nF 330 nF 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 330 µF to 1.1 mF (1.1 to 3.3) mF 3.3 to 11) mF (11 to 33) mF (33 to 110) mF	3.8 mF/F + 7.7 pF 1.9 mF/F + 7.7 pF 1.9 mF/F + 77 pF 1.9 mF/F + 230 pF 1.9 mF/F + 770 pF 1.9 mF/F + 2.3 nF 1.9 mF/F + 7.7 nF 3.1 mF/F + 23 nF 3.5 mF/F + 77 nF 3.5 mF/F + 230 nF 3.5 mF/F + 770 nF 3.5 mF/F + 2.3 µF 3.5 mF/F + 7.7 µF 5.8 mF/F + 23 µF 8.5 mF/F + 77 µF	MS-0025852
Oscilloscope[3] – Leveled Sine Wave Amplitude at 50 Ω (0 to 5.5) V	50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	15 mV/V + 230 µV 27 mV/V + 230 µV 31 mV/V + 230 µV 46 mV/V + 230 µV	MS-0035501
Oscilloscope[3] – Leveled Sine Wave Amplitude Relative to 50 kHz at 50 Ω (0 to 5.5) V	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	12 mV/V + 76 µV 15 mV/V + 76 µV 31 mV/V + 76 µV	MS-0035501
Oscilloscope[3] – Time Marker	(2 to 100) ns 100 ns to 100 µs 100 µs to 20 ms 50 ms to 1 s (1 to 5) s	1.4 µs/s 1.4 µs/s 0.6 µs/s 0.7 µs/s 0.8 ms/s	MS-0035501

Parameter/Range	Frequency / Time	CMC[2, 4] (±)	Comments
Leakage Current Tester – Input Voltage to Milliampere Ratio			MS-0039754
(1 to 3.3) V	(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	0.017 % of reading 0.015 % of reading 0.013 % of reading 0.017 % of reading 0.033 % of reading 0.12 % of reading 0.85 % of reading 2.2 % of reading	
(3.3 to 7) V	(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	0.014 % of reading 0.015 % of reading 0.01 % of reading 0.013 % of reading 0.026 % of reading 0.077 % of reading 0.50 % of reading 3.4 % of reading	
Surge Generator – Front Time / Rise Time	(0 to 1) µs (1 to 2) µs (2 to 10) µs	0.3 % of reading 0.2 % of reading 0.1 % of reading	MS-0041716
Surge Generator – Duration	(10 to 720) µs	0.1% of reading	MS-0041716
Surge Generator – Open Circuit Peak Voltage	1000 V (1000 to 5000) V (5000 to 6000) V (6000 to 7200) V	0.7 % of reading 0.6 % of reading 0.4 % of reading 0.3 % of reading	MS-0041716

Parameter/Range	Temperature	CMC[2, 4] (±)	Comments
Temperature – Generate[3] PT 385 1000 Ω (Electrical Simulation of Temperature)	(-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	0.023 °C 0.023 °C 0.031 °C 0.039 °C 0.046 °C 0.054 °C 0.054 °C 0.018 °C	MS-0021071
Temperature – Generate[3] PT 385 100 Ω (Electrical Simulation)	(-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	0.039 °C 0.039 °C 0.054 °C 0.07 °C 0.077 °C 0.093 °C 0.18 °C	MS-0021071
Temperature – Generate[3] (Electrical Simulation of Thermocouple Indicators)			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.21 °C 0.12 °C 0.11 °C 0.13 °C 0.18 °C	MS-0021071
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.26 °C 0.14 °C 0.12 °C 0.2 °C 0.31 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.49 °C 0.19 °C 0.12 °C 0.11 °C	

III. Thermodynamics

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Base Metal Thermocouples[3] (TC)	(-95 to 0) °C (0 to 100) °C (100 to 425) °C	0.30 °C 0.27 °C 0.21 °C	MS-0021070
Thermometer Readout[3] Including Sensor	(-95 to 0) °C (0 to 100) °C (100 to 425) °C	0.051 °C 0.052 °C 0.083 °C	MS-0021070
Environmental Data Logger Temperature	(10 to 40) °C	0.3 °C	MS-0039755
Environmental Data Logger Humidity	(15 to 95) %RH	1.4 %RH	MS-0039755
Environmental Chambers[3] Temperature	(-70 to -40) °C (-40 to 0) °C (0 to 100) °C (100 to 200) °C (200 to 340) °C	0.65 °C 0.38 °C 0.53 °C 2 °C 3.5 °C	MS-0021069
Environmental Chambers[3] Humidity	Up to 15 %RH (15 to 35) %RH (35 to 50) %RH (50 to 80) %RH (80 to 98) %RH	2.2 %RH 2.3 %RH 2.4 %RH 2.7 %RH 2.8 %RH	MS-0021069

IV. Time & Frequency

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Frequency – Generate[3]	0.01 Hz to 1.2 kHz 1.2 kHz to 1.2 MHz (1.2 to 2) MHz (2 to 600) MHz	3.9 nHz/Hz + 0.58 Hz 39 nHz/Hz + 60 Hz 6.5 nHz/Hz + 0.58 kHz 2 x 10^{-6} Hz/Hz	MS-0020876
Frequency – Measure[3]	0.2 Hz to 500 MHz	3.5 x 10^{-6} Hz/Hz	MS-0041689

V. Mechanical

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Scales and Balances	1 mg 1 mg to 500 mg 100 mg to 1 g (1 to 50) g (50 to 100) g (100 to 200) g (200 to 500) g (0.5 to 2) kg (2 to 4) kg (4 to 6) kg (6 to 8) kg (8 to 10) kg (10 to 20) kg (20 to 30) kg (30 to 35) kg	0.059 mg 0.069 mg 0.000 12 g 0.000 13 g 0.000 21 g 0.000 37 g 0.058 g 0.059 g 0.099 g 0.17 g 0.072 g 0.000 29 kg 0.000 45 kg 0.000 49 kg 0.000 51 kg	MS0048503
Mass	1 mg 2 mg 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g	0.011 mg 0.0084 mg 0.0093 mg 0.0085 mg 0.016 mg 0.017 mg 0.024 mg 0.025 mg 0.039 mg 0.000 031 g 0.000 048 g	MS0048503

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Mass (cont.)	5 g 10 g 20 g 50 g 100 g 200 g 1 kg 2 kg 5 kg 10 kg 20 kg	0.000 06 g 0.000 075 g 0.000 085 g 0.000 12 g 0.000 2 g 0.000 37 g 0.000 005 2 kg 0.000 011 kg 0.000 027 kg 0.000 055 kg 0.000 34 kg	MS0048503
Pressure Gauge	(Up to 7) MPa (Up to 70) MPa	0.067 % of reading 0.039 % of reading	MS0048479

[1] This laboratory offers commercial 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.

Accredited Laboratory

A2LA has accredited

TUV RHEINLAND JAPAN, YOKOHOMA LABORATORIES

Yokohama-Kanagawa, Japan

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 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 3rd day of May 2023.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 5056.03
Valid to March 31, 2025

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